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HIRATSUKA (N.). **Phakopsora of Japan I, II, III.**—*Bot. Mag., Tokyo*, xlix, 587, pp. 781–788; 588, pp. 853–860, 1935; l, 589, pp. 2–8, 1936.

The following items are of special interest in this critical discussion, supplemented by fungus and host indexes, of the twelve species of *Phakopsora* (the distribution of which is shown in tabular form) studied by the author in Japan. *P. pachyrhizi* (synonyms of which are considered to include *P. sojae* Saw., *Uredo sojae* P. Henn. [*R.A.M.*, xiii, p. 398], *Uromyces sojae* Miura non Sydow [ibid., vi, p. 74], and *P. vignae* Arthur in *N. Amer. Fl.*, vii, p. 673, 1925) has been found widely distributed throughout the northern Provinces on soy-beans, *Glycine ussuriensis*, *Pachyrhizus bulbosus* [*P. erosus*], and *Pueraria thunbergiana*, the last-named host apparently constituting a new record for the rust. The fungus has also been reported from the West Indies, Java, the Philippines, and Manchuria.

P. zizyphi-vulgaris has been observed on *Paliurus ramosissimus* [*R.A.M.*, xiv, p. 719] and *Zizyphus vulgaris* var. *inermis* in Formosa, while specimens have also been examined on *Z. vulgaris* var. *spinosus* from China and Manchuria and on *Z. sativa* from China.

P. ampelopsidis (syn. *P. vitis*) [ibid., iv, p. 655; vi, p. 460; x, p. 343] occurs on *Ampelopsis heterophylla* [*Parthenocissus tricuspidata*], *Vitis coignetiae*, *V. flexuosa*, and cultivated vines in various parts of Japan, and has also been reported from North and South America, the West Indies, and the Philippines.

GOTO (K.). **Sclerotium rolfsii Sacc. in perfect stage. III. Variation in the cultures originated from basidiospores.**—*J. Soc. trop. Agric. Taiwan*, vii, pp. 331–345, 3 figs., 1 diag., 1935.

Some of the numerous monobasidiosporous isolations from the *Corticium* stage of *Sclerotium rolfsii* [*R.A.M.*, xiv, p. 387; xv, p. 324] examined by the writer at the Taihoku Imperial University, Formosa, were found to fall within the limits of variation of the species, while the remainder were so aberrant as to be barely recognizable as the same fungus. From matings in all possible combinations between these aberrant isolations, several strains apparently identical (apart from certain variations in cultural characters and growth rate) with *S. rolfsii* in its typical form were obtained, thereby affording presumptive

evidence of heterothallism in the species. When sectorial strains were isolated from the colonies derived from mass sowing of basidiospores of the Indian and American, as well as Formosan strains, and compared with the original, a proportion varied similarly to the foregoing. By means of Nakata's aversion criterion [ibid., vi, p. 55] it was ascertained that a few of the aberrant strains showed marked repulsion when tested against the original, while most of the remainder exhibited a similar phenomenon in a slighter degree. The sectorial strains may therefore be considered as distinct strains of *S. rolfsii* in the usual sense of the word.

On the basis of these data the spontaneously developing natural strains of the fungus are interpreted as heterozygous clones. It is further suggested that the recombination of hereditary factors in the course of sexual reproduction may be an important cause of variation in nature.

Wolf (F. A.). **Tobacco diseases and decays.**—xix+454 pp., 1 pl., 106 figs., 5 graphs, Durham, North Carolina, Duke University Press, 1935. Price $5.

In this book, the first devoted solely to the subject in the English language, the author gives a concise, comprehensive account of the diseases of the tobacco plant occurring in all parts of the world when the crop is cultivated, and of the decays of the harvested product. After an introductory chapter comprising brief, semi-popular notes on diseases of plants in general and of tobacco in particular, an outline of the classification of *Nicotiana*, and an historical sketch of the origins of the plant, the writer discusses seed-bed sanitation in relation to tobacco diseases. Then follow chapters on nutritional diseases (some 30 pp.), diseases due to unfavourable water relations, little known and non-infectious disorders and diseased conditions, virus diseases (86 pp.), bacterial diseases (57 pp.), fungous diseases of the growing crop (105 pp.), diseases caused by nematodes, diseases caused by parasitic phanerogams, and decays during curing, fermentation, and storage, and after manufacture.

In general, an attempt has been made to describe the symptoms of each disease, then to consider its cause, the factors favouring its development and dissemination, and finally control measures. Citation is made of pertinent literature with each disease and a bibliography (down to 1934) of some 50 pages is appended. The publication of this volume adds a further welcome and most useful contribution to the series of monographs dealing with diseases of special crops.

Van Der Weij (H. G.). **Ziekten der Tabak.** *Ex* **Overzicht van de ziekten en plagen der Deli-Tabak in het jaar 1935.** [Tobacco diseases. *Ex* Survey of the diseases and pests of Deli Tobacco in the year 1935.]—*Meded. Deli-Proefst.*, Ser. 2, xciii, pp. 3–11, 1936.

During the period under review it was necessary to break up 54,837 tobacco seed-beds on the estates under the supervision of the Deli Experiment Station on account of slime disease (*Bacterium solanacearum*) compared with 39,317 in 1934 [*R.A.M.*, xiv, p. 658], the average incidence of infection being 10·6 as against 8·4 per cent. in the

previous year. In four plantations belated infection by *Bact. solanacearum* resulted in hollow stalks. Stem scorch caused by *Rhizoctonia* [*Corticium*] *solani* [ibid., x, p. 276; xiii, p. 61] was prevalent in the field, inducing symptoms reminiscent of slime disease, with which it has no doubt been confused. *Cercospora nicotianae* [ibid., xiv, p. 473] was somewhat more in evidence than in 1934, chiefly on black dust soils. Notes are also given on the virus diseases mosaic ('peh sim'), Rotterdam B, 'gilah', 'korab', ring spot, and 'daon lidah', on miscellaneous physiological and climatological disturbances, and on disorders affecting tobacco during the processes of curing and fermentation, including a few cases of infection by *Oospora nicotianae* [ibid., viii, p. 75].

MATSUMOTO (T.) & HIRANE (S.). **Immunological studies of mosaic diseases. V. Micro-serological tests as means of detecting the virus in a small area of mosaic Tobacco plants.**—*J. Soc. trop. Agric. Taiwan*, vii, pp. 346–350, 2 figs., 1935.

A brief description is given of a method devised by the writers for the determination of the concentration of the tobacco mosaic virus [*R.A.M.*, xiv, p. 402] in small areas of the infected tissue. About 0·05 c.c. of undiluted (or 1:2) anti-mosaic serum is introduced by means of a fine capillary pipette into small tubes (about 3 mm. external diameter) and roughly the same quantity of ground, centrifuged plant extract at dilutions of 1:10, 1:20, 1:40, or 1:80 gently added in such a way as to leave a zone between the two constituents. After one hour's incubation at 37° C. the determinations were made by noting the presence or absence, as well as the extent, of the flocculence or precipitate at the zone of contact. For the preparation of the extract only 0·05 to 0·1 gm. of plant material was required.

The infective principle was found to accumulate more abundantly in the pale than in the dark green areas of mosaic foliage and in the roots than in the stems, though it is pointed out that these observations require confirmation by parallel inoculation tests.

DUGGAR (B. M.) & HOLLAENDER (A.). **Inactivation of the virus of typical Tobacco mosaic and of Escherichia coli in the shorter ultra-violet.**—Abs. in *J. Bact.*, xxxi, 1, p. 52, 1936.

A highly purified, stirred suspension of the typical tobacco mosaic virus was irradiated in the presence of *Escherichia* [*Bacillus*] *coli* with measured quantities of monochromatic ultra-violet rays from λ 2,250 to 3,000 Å., the experiment being so performed as to enable the relative resistance as well as the wave-length dependence of both organisms to be compared [cf. *R.A.M.*, xiii, p. 541]. It was found that the amount of energy necessary to destroy 50 per cent. of the virus in suspension (physiological salt solution) at λ 2,250 Å. is only one-fifth of that requisite at 2,650 Å., whereas the amount needed for the inactivation of *B. coli* in the same suspension is higher at 2,250 than at 2,650 Å. [cf. ibid., xv, p. 4].

GRAINGER (J.). **Low-temperature masking of Tobacco mosaic symptoms.**—*Nature, Lond.*, cxxxvii, 3453, pp. 31–32, 1 fig., 1 graph, 1936.

On 5th October, 1934, six young tobacco plants with mosaic symptoms

were placed in a cool greenhouse until 16th November, by which time three apparently healthy new leaves had been formed on each. The plants were then transferred to a fully illuminated glass chamber at 75° F., under which conditions mosaic symptoms developed within seven days on the new growth made above the masked foliage [cf. *R.A.M.*, xii, p. 581], the latter remaining apparently sound. All the plants were afterwards removed to the cool house (mean temperature 51°, maximum 57°), where they made further growth without any obvious sign of mosaic. Similar results were obtained in 1935 with five plants maintained at a mean temperature of 45°; on another five kept at 55° faint mottling occurred. Under local (Huddersfield) conditions the plants grow most rapidly at 75°, whereas the virus apparently travels with maximum velocity between 75° and 85° [ibid., xii, p. 792].

STANLEY (W. M.) & LORING (H. S.). **The isolation of crystalline Tobacco mosaic virus protein from diseased Tomato plants.**—*Science*, N.S., lxxxiii, 2143, p. 85, 1936.

Using an improved procedure based on that previously employed for the isolation of a crystalline protein from mosaic tobacco [*R.A.M.*, xiv, p. 721], the writers obtained from tomato plants infected by the tobacco mosaic virus a substance with the same crystalline form, optical activity, and chemical composition. At a reaction of greater alkalinity than P_H 11 or more acid than P_H 1 the protein is denatured and the virus activity lost, a similar result, with coagulation, following heating to 94° C. The isoelectric point of the crystals from both tobacco and tomato plants was ascertained by cataphoresis tests to be about P_H 3·2. At hydrogen-ion concentrations more alkaline than P_H 3·2 the crystals from both sources migrate to the positive electrode, whereas at more acid reactions they proceed to the negative one.

There appeared to be little difference in the virulence of the proteins from tobacco and tomato with the half-leaf method of inoculation, 1 c.c. of a solution containing only 10^{-9} gm. of the crystalline substance from either source usually proving infectious. The protein from mosaic tomatoes in solution at a strength of 10^{-5} gm. and upwards per c.c. gives a precipitate when mixed with the sera of animals previously injected with either the crystalline substance from diseased tobacco plants or the juice from such plants. The isolation from a different host of a protein possessing the same properties as that from mosaic tobacco is considered to afford fresh evidence for the identity of the protein with the agent responsible for the disease.

BEST (R. J.). **The effect of environment on the production of primary lesions by plant viruses.**—*J. Aust. Inst. agric. Sci.*, i, 4, pp. 159–161, 1935.

In these studies the effect of temperature and light on the number and development of primary lesions produced by the viruses of tomato spotted wilt and ordinary tobacco mosaic was investigated [*R.A.M.*, xiv, p. 781]. Using the former virus inoculated on tobacco, it was found that lesion development is inhibited by bright sunlight or by controlled artificial light. In the case of tobacco mosaic on *Nicotiana glutinosa*, more primary lesions develop under glasshouse conditions than in the

laboratory, and controlled experiments showed that provided the light available is sufficient for normal growth the difference is a temperature effect. Under comparable conditions, 2,932 lesions developed at 20° C. and 2,253 at 15°, a difference which is highly significant. Discussing the dilution curve for tobacco mosaic, the author states that the physiological age of the test plants and the conditions under which the lesions develop appear to have an effect on the range over which the straight line (middle portion) obtains. The curve for tomato spotted wilt is like that of tobacco mosaic, except that at high dilutions the slope of the curve depends upon conditions prevailing whilst the lesions are developing, and also upon the time elapsing between the first appearance of the lesions and the time of counting. The tendency of lesions to form near the lateral veins points to the possibility that the critical infective unit (possibly amounting to some millions of virus particles) may be smaller in the neighbourhood of the veins.

RÖDER (K.). **Untersuchungen über die Phytophthorakrankheit (Phytophthora infestans) der Tomate. Unter besonderer Berücksichtigung der biologischen Spezialisation des Erregers.** [Studies on the *Phytophthora* disease (*Phytophthora infestans*) of the Tomato, with particular reference to biologic specialization in the causal organism.]—*Phytopath. Z.*, viii, 6, pp. 589–614, 9 figs., 1935.

From the results of this fully tabulated account of the writer's studies on late blight of tomatoes (*Phytophthora infestans*) [*R.A.M.*, xv, p. 324] at the Biological Institute, Berlin-Dahlem, it appears that the course of the disease in the foliage is similar to that pursued by the fungus in potato leaves. The germ-tubes of the zoospores penetrate the uninjured epidermal cells and proceed thence into the intercellular system, the incubation period ranging from four to six days. On tomato leaves, however, the fungus does not fructify quite so luxuriantly as on those of the potato. The epidermis of the fruit is an insuperable obstacle to penetration by *P. infestans* unless the tissues are wounded, in which case direct entry is practicable. Usually the organism is reduced to indirect means of ingress through the pedicel and calyx leaves. The small, brown spots formed on the epidermis converge, sink inwards, and may eventually cover the whole fruit. Except in the case of injured fruits the fructifications of the fungus are much sparser on these organs than on the leaves.

At least two biologic forms of *P. infestans* may be differentiated on the tomato. One ('T') showed an excessively high degree of virulence towards all the varieties used in the tests, almost completely destroying 50- to 60-day-old plants within 10 to 12 days. The other ('L'), which is thought to be probably identical with the 'A' group from potato [ibid., xiv, p. 390], ceased to develop after producing dry spots on the leaves. Neither 'T' nor 'L' is capable of penetrating the uninjured epidermal tissues of the tomato fruit, but once arrived in the interior of the latter both develop profusely. The 'A' and 'S' forms of *P. infestans* from potato behaved similarly to 'L' on the tomato, while the reactions induced by the latter in cultivated potatoes (Ackersegen, Erstling [Duke of York], Industrie, Parnassia, Preussen, and Wohltmann) and the W types resembled those called forth by 'A'. Hence it

would appear that the 'L' form of *P. infestans* from tomato is identical with the potato biotype 'A'.

None of the 81 cultivated tomato varieties tested gave any marked indication of resistance to the 'T' or 'L' forms, while the former also virulently attacked the closely related *Solanum racemigerum*, *S. racemiflorum*, *S. humboldtii*, and *S. tomatillo*. For the time being, therefore, the prospects of breeding for immunity from late blight in tomatoes are not very encouraging, and American reports of resistant varieties should not be too readily accepted.

SIMMONDS (J. H.). **Diseases of the Tomato.**—*Qd agric. J.*, xlv, 1, pp. 5–11, 7 figs., 1936.

Brief, popular notes are given on the symptoms and control of the following tomato diseases occurring in Queensland, viz. *Phytophthora infestans* [see preceding abstract], *Septoria lycopersici* [*R.A.M.*, xv, p. 65], *Alternaria solani* [ibid., xv, p. 265], *Bacterium solanacearum* [ibid., xiv, pp. 337, 686], *Fusarium* [*bulbigenum* var.] *lycopersici* [ibid., xiv, p. 498 and next abstract], *Verticillium albo-atrum* [ibid., xiv, p. 283], mosaic [ibid., xv, p. 181], spotted wilt [ibid., xv, p. 324], 'big bud' [ibid., xv, p. 182], streak [ibid., xiv, p. 348], and blossom-end rot [ibid., xiv, p. 800]. The paper concludes with a brief list of routine measures recommended for controlling tomato diseases.

FISHER (P. L.). **Physiological studies on the pathogenicity of Fusarium lycopersici Sacc. for the Tomato plant.**—*Bull. Md agric. Exp. Sta.* 374, pp. 261–281, 10 figs., 1935. [Abs. in *Exp. Sta. Rec.*, lxxiv, 3, pp. 357–358, 1936.]

Bonny Best and Marglobe tomatoes, the former susceptible and the latter comparatively resistant to *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, xiii, p. 218 and preceding abstract] under normal conditions of cultivation, were grown in solutions with an excess or deficiency of boron, calcium, magnesium, potash, nitrogen, phosphorus, and sulphur and inoculated with the fungus. In both varieties resistance was increased by deficiencies of boron, nitrogen, and sulphur and susceptibility enhanced by excesses of these elements. Resistance in Bonny Best was also strengthened by deficiencies of magnesium and phosphorus and excesses of calcium, magnesium, and phosphorus; potash deficiency increased resistance and excess caused no change in the susceptibility of this variety. In the case of Marglobe resistance was reduced by deficiencies of calcium and potash and excess of the latter, but increased by both deficiencies and excesses of magnesium and phosphorus.

The results of greenhouse plot trials indicated that heavy applications of lime accompanying a well-balanced fertilizer (e.g., 4–10–6) would be of practical utility in the reduction of wilt infection.

Thermostable toxic properties were found to reside in filtrates from 18-day-old cultures and extracts from fungal mats [ibid., xiv, p. 310]. Untreated Marglobe juice inhibited the growth of *F. bulbigenum* var. *lycopersici* in pure culture, but autoclaving or ultrafiltration destroyed this effect, which was not exerted by Bonny Best juice.

KOCHMAN (J.). **Brunatna pleśń Pomidorów—Cladosporium fulvum Cooke i jej zwalczanie.** [Tomato leaf mould—*Cladosporium fulvum* Cooke, and its control.]—*Roczn. Nauk ogrod.*, ii, pp. 81–94, 2 figs., 1935. [English summary.]

This is a brief, semi-popular account of the morphology and biology of *Cladosporium fulvum* [*R.A.M.*, xv, p. 324], which is stated to have been found for the first time in Poland in 1930, since when it has been observed, sometimes in epidemic form, in several localities of that country, both in glasshouses and in the field, causing serious damage to the crop. Control experiments indicated that the best results are obtained by spraying the growing plants under glass and in the open with 1 in 60 lime-sulphur. Infected glasshouses should also be thoroughly sprayed with lime-sulphur before setting out tomato seedlings in them.

SIEMASZKO (W.). **Choroba naczyniowa Wiązów Ceratostomella (Graphium) ulmi (Schwarz) Buisman w Polsce.** [The vascular disease of the Elm, *Ceratostomella* (*Graphium*) *ulmi* (Schwarz) Buisman, in Poland.]—*Roczn. Nauk ogrod.*, ii, pp. 163–172, 1 pl., 1 fig., 1935. [English summary.]

The author states that the Dutch elm disease (*Ceratostomella ulmi*) in Poland [*R.A.M.*, xiv, p. 264; xv, p. 328] was first officially recorded in 1935 in Pomerania on old *Ulmus campestris* trees planted on the banks of the Vistula, the latter three annual rings of which showed the discoloration characteristic of the disease. In the same year the fungus in its coremial and *Cephalosporium*-like stages was also found in dead twigs on old *U. montana* trees in the Warsaw Botanic Garden, which were severely attacked by bark borers (*Scolytus scolytus* and *S. multistriatus*); these beetles are also prevalent on elms in Pomerania. The morphology and biology of the fungus are briefly described from literature.

MARTÍNEZ (J. B.). **La grafiosis del Olmo y la demostración de su existencia en España.** [Graphiosis of the Elm and the demonstration of its existence in Spain.]—Issued by Inst. for. Invest. Exp., La Moncloa, Madrid, ix, 15, 29 pp., 6 pl., 1936. [German and French summaries.]

In the first part of this paper a general account of the die-back of elms caused by *Ceratostomella ulmi* [see preceding abstract] is given, while in the second particulars are furnished of the detection of the disease in Spain and the cultivation of the causal organism, the identity of which was confirmed by Prof. J. Westerdijk. Suspicious symptoms were first observed near Madrid on *Ulmus campestris* in 1932, but the attempted isolation of a pathogen from the affected branches, which presented all the external, internal, and histopathological features of a tracheomycosis, gave negative results. In 1935, however, *C. ulmi* developed in potato juice agar cultures from similarly affected trees near Burgos. This is a new record for Spain, which must now be added to the list of countries [*R.A.M.*, xiv, p. 264] known to harbour the elm pathogen.

Gilman (J. C.), McNew (G. L.), & Davis (G. N.). **Fungi associated with tree cankers in Iowa. I. Preliminary survey.**—*Iowa St. Coll. J. Sci.*, x, 2, pp. 151–153, 1936.

With the aid of the Civilian Conservation Corps in Iowa, material was collected from standing trees in parks and shelter belts, showing the early stages of decline with a view to the determination of the causal organisms of cankers. The 213 identifiable species of fungi occurring on 713 of the 860 specimens of ten hosts examined were distributed in 87 genera, the more common species being *Scoleconectria scolecospora* on *Pinus strobus*, *Valsa pini* [*R.A.M.*, ix, p. 205] and *Cytospora pinicola*, possibly the conidial stage of the foregoing, both on the same host, *C. annularis* on green ash (*Fraxinus pennsylvanica* var. *lanceolata*), *Sphaeropsis ellisii* [cf. below, p. 412] on *P. strobus* and *P. sylvestris*, and *C.* [*V.*] *nivea* [ibid., xv, p. 162] on *Populus alba*, *P. deltoides*, and *P. tremuloides*. Few data are available at present regarding the parasitism of the fungi involved but they appear to be chiefly secondary invaders following other injuries.

Servazzi (O.). **Ricerche sulla preservazione dalle muffe delle Castagne disinfestate con l'immersione in acqua a 50° C. per 45'.** [Researches on the preservation from moulds of Chestnuts disinfected by immersion in water at 50° C. for 45 minutes.]—*Difesa Piante*, xii, 6, pp. 191–203, 1935.

Further studies conducted at Turin to determine the best methods for the pre-shipment treatment of export chestnuts from Piedmont [*R.A.M.*, xiii, p. 65; xiv, p. 801] showed that the hot-water treatment [loc. cit.] against insects predisposes the fruits to mould infection, overmature fruits becoming infected sooner than others. The best conditions for preservation occur when the drying eliminates all the water absorbed during the treatment (from 2·5 to 15 per cent.). To secure this result the temperature and period of drying must be varied to suit the variety of chestnut being treated. If the chestnuts are left in water for periods ranging from 2 to 12 days before hot-water treatment at 50° C. for 45 minutes, the development of internal moulds is prevented but no effect is produced on the external moulds. The addition to the water of various fungicides, including formaldehyde, gave negative or inconclusive results, though internal mould development was to a certain extent prevented or retarded by silver fluoride at a strength of 1 in 500,000.

Allain (A.). **Contribution à l'étude du Phytophthora cambivora. Morphologie, cytologie et action pathogène du parasite.** [A contribution to the study of *Phytophthora cambivora*. / The morphology, cytology, and pathogenic action of the parasite.]—127 pp., 16 pl. (2 col.), 18 figs., Paris, Typographie Firmin-Didot et Cie., 1935.

In this paper the author gives the results of his detailed study on the morphology, cytology, and parasitic action of *Phytophthora cambivora* [*R.A.M.*, xiii, pp. 65, 603; xv, p. 378]. He found that sporangia of the fungus were produced most freely on Petri's synthetic mineral solution [ibid., iv, p. 133] but also in a solution containing 0·2 per cent.

ammonium nitrate and in Knop's solution. Sexual organs were numerous in 15 to 30 days on Petri's synthetic medium solidified with 2 per cent. agar and developed freely also on an agar made with the solution diluted $\frac{1}{2}$ to $\frac{1}{32}$, as well as on distilled water agar after 15 to 25 days. Their production seemed to be favoured by exposing the cultures to considerable changes of temperature (23° C. by day, 13° by night) at regular intervals.

Most of the antheridia are amphigynous [cf. loc. cit.]; some of the oogonia have no antheridium and may possibly develop parthenogenetically, and one antheridium was observed adhering to the side of the oogonium, suggesting the paragynous position.

While in the chestnut *P. cambivora* produces a blackening of the tissues, followed by a secretion of black liquid, in experimentally inoculated lupins it caused only a yellow or brown discoloration; in both hosts there was distinct hyperplasia at the inoculation site. In both, mycelial swellings [ibid., x, p. 123] were formed and the fungus was present both intra- and intercellularly, according to the cell resistance which appeared to be increased by an abundance of starch grains. The cytological changes resulting from infection took the form of disintegration of the chloroplasts, digestion of starch grains, agglomeration of the oil drops present in healthy cells, and, in the lupin, of the appearance of tannins in the tissues. The presence of tannins in infected chestnuts does not appear to be due to the fungus, as healthy chestnut tissues contain them in large quantities. The break-up of the vacuolar system was more marked in chestnut than in lupin cells. In both the chondriome finally assumed the form of granules. Complete nucleolysis was more commonly observed in affected chestnut than in affected lupin cells.

A close morphological and cytological similarity exists between *P. cambivora* and *P. erythroseptica* [ibid., xiii, pp. 180, 531]. The sporangia and intercalary bodies produced by both are identical, as are the oospores and the manner of their development. The most marked difference is that with *P. erythroseptica* oogonia are very easily obtained in culture while with *P. cambivora* their production is secured only with great difficulty. Cytological details are given of the mycelium and the sexual organs.

A bibliography of 28 pages is appended.

Hepting (G. H.) & Blaisdell (Dorothy J.). **A protective zone in Red Gum fire scars.**—*Phytopathology*, xxvi, 1, pp. 62–67, 2 figs., 1936.

Of seven hardwoods studied in a recent pathological investigation in the Mississippi Delta, red gum (*Liquidambar styraciflua*) and persimmon (*Diospyros virginiana*) appeared to be the most resistant to decay through fire scars, the former showing only 42 and the latter 20 per cent. infection compared with 100, 82, 80, 72, and 47 per cent. in hackberry (*Celtis laevigata*) [Willd. = *C. mississipiensis* Bosc], oaks (*Quercus nuttallii*, *Q. lyrata*, and *Q. nigra*), and ash (*Fraxinus* spp.), respectively. Shortly after scarring the two resistant species form hard, dark zones on the surfaces of the scars, extending to a depth of 2 to 10 mm. into the wood.

A detailed study was made of the protective zone in *L. styraciflua*,

from which it appears that several outer layers of sapwood cells are usually involved, and that the cells within the zone are heavily infiltrated with a brown, gum-like substance nearly filling the lumina of the fibres and occurring in considerable amounts in the largest vessels. Inoculation experiments under controlled conditions on autoclaved blocks of red gum ¼ in. sq. and ½ in. long, each block including part of the protective zone and adjacent sapwood, with *Polyporus* [*Polystictus*] *pergamenus* [*R.A.M.*, xi, p. 275] and *Polyporus gilvus* [ibid., xiv, p. 795] gave completely negative results as regards the gum-filled zone, which was as hard and firm after a year's exposure to fungal action as at the outset of the trial, whereas the normal sapwood was heavily attacked by both fungi and crumbled at the least pressure. It would seem that the gum-filled protective zone may preserve the underlying sapwood from desiccation and subsequent decay for lengthy periods, many cases having been observed in which large fire scars on *L. styraciflua* have entirely healed without any rotting of the area behind them. Repeated exposure to the action of fire, however, may destroy the protective zone and thus afford ready ingress to invading fungi or insects. The supplementary function of the gum-filled zone as a mechanical barrier to the fungal mycelium must also be borne in mind.

KHESWALLA (K. F.). **Seedling blight of Cinchona ledgeriana Moens caused by Phytophthora palmivora Butl. in the Darjeeling district.**—*Indian J. agric. Sci.*, v, 4, pp. 485–495, 1 col. pl., 1935.

Cinchona ledgeriana seedlings in Darjeeling became affected in 1928 by a serious blight. A discoloration began at the collar and spread to the cotyledons, which became limp and bent over. The leaves turned yellow, curled inwards, and were occasionally shed. Rotting ensued, and when the bark tissues had begun to decompose and the inner vascular regions had become affected the seedlings hung down from the affected part and died. Several seedlings died from the top downwards, indicating that infection can also be air-borne.

Affected material showed the presence of a *Phytophthora* identified as a strain of *P. palmivora* [*R.A.M.*, xiii, p. 812]. As the fungus did not form oospores in culture paired cultures were made with *P. colocasiae*, *P. parasitica*, *P. meadii*, and *P. palmivora*, respectively [ibid., xv, p. 378], and also by growing together monosporangial isolates from diseased cinchona plants. In the latter set of paired cultures no oospores were found, while in the former they were obtained with all the fungi used, except *P. meadii*, at 22° C.

The optimum temperature for growth of the fungus was about 24°, and the maximum between 32·5° and 35° Inoculations of the stems and leaves of cinchona seedlings with pure cultures of the fungus gave positive results, the organism being reisolated. It was also pathogenic to leaves of castor [*Ricinus communis*] and palm, whereas *P. parasitica* and *P. colocasiae* were unable to infect cinchona seedlings, though a strain of *P. palmivora* did. Statistical comparison of the dimensions of the stalked sporangia of the cinchona fungus and those of *P. palmivora* showed the former to average 33·3±0·39 by 17·6±0·19 μ, agreeing with the latter in length but being a little narrower.

FURTADO (C. X.). **A disease of the Angsana tree.**—*J. Malay. Br. Asiat. Soc.*, xiii, 2, pp. 163–192, 1935.

After briefly outlining the history of an obscure disease of the 'angsana' tree (*Pterocarpus indicus*, a very popular avenue tree throughout the Malay Peninsula), which was first recorded in the seventies of last century in Malacca, whence it has since spread to other parts of Malaya, the author gives the results of his own studies of the trouble since 1923. The disease is characterized by an initial withering and death of young branches bearing leaves and fruits, followed by a rapidly developing die-back of the larger branches and finally the death of the whole tree within two or three months from the first appearance of the symptoms. Sometimes an attempt at recovery is made by the formation of shoots from near the base. Mycological examination of dead angsana wood revealed the presence of several Basidiomycetes, and most frequently of *Schizophyllum commune* [cf. *R.A.M.*, xiii, p. 641]. *Dothidella pterocarpi* was also frequently found causing brown patches and holes in living leaves, but did not appear to have any serious effect on the tree. Attempted isolations from diseased living tissues gave negative results.

Following a survey of the various theories regarding the cause of the disease, the author suggests that it may be caused by a Jassid, the activity of which apparently interferes with the physiology of the tree, bringing about death. Possible means for the control of the disease are very briefly indicated.

DIMITROFF (T.). **Приносъ къмъ изучване насѣкомнитѣ и гжбнитѣ вредители на нашитѣ гори и горски култури.** [Contribution to the study of the insect pests and fungal diseases of our natural and cultivated forests.]—*Annu. Univ. Sofia*, xiii, pp. 220–252, 10 figs., 1935. [French summary.]

In an introduction to this paper the author states that, owing to favourable ecological conditions, the natural forests of Bulgaria are very resistant to the attacks of insects and fungal diseases, but with the introduction of silvicultural methods, aided by predatory systems of forest exploitation, together with considerable damage done by fire, the health standard of the forests is rapidly declining; recent surveys have resulted in the recording of 21 species of pathogenic fungi, the relative importance of which increases from year to year. The following species may be mentioned. *Aecidium elatinum*, the aecidial stage of *Pucciniastrum* [*Melampsorella*] *caryophyllacearum* [or *M. cerastii*: *R.A.M.*, ix, p. 602; xii, p. 666] is widespread on firs in the whole country, especially in the form of stem cankers, and causes considerable losses. *P. padi* [*Thecopsora areolata*: ibid., xiii, p. 313] was very prevalent in 1934 in the State forestry of Tcham-koria on spruce cones, considerably reducing the germinability of the seeds contained in them. This tree is also widely attacked by *Chrysomyxa abietis* [ibid., ix, p. 205], and *Lophodermium macrosporum* [ibid., xiii, p. 666] which, in seasons following a mild and rainy winter, frequently attains epidemic proportions. The Basidiomycetes listed include *Lenzites sepiaria* [ibid., xv, p. 332], *Polyporus borealis* [ibid., xiv, p. 803], and *P.* [*Fomes*] *hartigii* [ibid., xv, p. 68]. *Vaccinium vitis-ideae* in the Tcham-koria forestry was found to be infected with *Pucciniastrum goeppertianum*

[ibid., ix, p. 602; xii, p. 666], and may serve as a source of infection of firs with the fungus.

Mielke (J. L.). **Rodents as a factor in reducing aecial sporulation of Cronartium ribicola.**—*J. For.*, xxxiii, 12, pp. 994-1003, 1 fig., 1935.

In western North America various rodents have been observed to feed on the portions of white pine (*Pinus monticola*) bark attacked by *Cronartium ribicola* [*R.A.M.*, xv, p. 330], mostly during the late winter and early spring, when other foods are scarce. Well-matured cankers appear to be preferred. For most of the older blister rust infection centres in the western States it is estimated that rodents have removed 10 to 35 per cent. of the aecidia-bearing bark and thus effected a considerable reduction in the volume of spores for dissemination to the alternate (*Ribes*) hosts.

Goidànich (G.). **Le alterazione cromatiche parassitarie del legname in Italia. II. Una intensa colorazione del legno di Pino causata da Sphaeropsis ellisii Sacc., var. cromogena G. Goid. var. n.** [Parasitic staining of timber in Italy. II. An intense discoloration of Pine wood caused by *Sphaeropsis ellisii* Sacc. var. *cromogena* G. Goid. var. n.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 3, pp. 442-470, 4 pl., 15 figs., 1935.

This paper describing the disease of *Pinus pinea* caused in Italy by *Sphaeropsis ellisii* var. *cromogena* is an expanded version of one already noticed from another source [*R.A.M.*, xiv, p. 727].

Buchwald (N. F.). **En ny svampesygdom i Danmark. Didymascella thujina paa Thuja plicata.** [A new fungous disease in Denmark. *Didymascella thujina* on *Thuja plicata*.]—*Dansk Skovforen. Tidsskr., 1936*, pp. 51–59, 4 figs., 1936.

Branches of *Thuja plicata* in a Danish nursery were observed in October, 1935, to bear on the reddish-brown discoloured needles the small, circular to elliptical, olive-brown or nearly black, cushion-shaped apothecia of *Didymascella thujina* [*R.A.M.*, xiv, p. 794], with asci containing two broadly ellipsoid, dark olive, finely verrucose ascospores, 22 to 25 by 15 to 16 μ, unequally divided into two cells of which the upper is much the smaller. The ascospores are liberated from June to October, during which period infection takes place and among one- to four-year-old nursery trees the disease is liable to assume an epidemic character. It is possible that *D. thujina* was introduced into Denmark with a consignment of seed from British Columbia, but more likely, in the writer's opinion, that it has been present for some time in the country without attracting attention, the symptoms on the few older (15 years) trees affected being quite inconspicuous. Control measures should be based on the eradication of diseased individuals, supplemented by spraying with Bordeaux mixture.

Diseases and pests of the Bermuda Cedar.—*Agric. Bull. Bermuda*, xiv, 12, pp. 93–95, 1935.

The most interesting disease of the Bermuda cedar [*Juniperus bermudiana*] is the rust caused by *Gymnosporangium bermudianum* (Farl.)

Earle, which produces small, rounded galls on the twigs. At first deep red, after a few months (when they may be half an inch in diameter) they turn brown. The portion of the twig beyond the gall is generally killed, and when the fungus is abundantly present a significant amount of damage may be caused by the death of the twigs.

A fungus agreeing in spore characters with *Pestalozzia funerea* [*R.A.M.*, xiii, p. 598] was isolated from dead or dying branches of cedar and various conifers, but its pathogenic capability is not known. Another fungus, apparently a *Phomopsis*, is stated to be very common in Bermuda on the dead scales clothing the larger twigs of cedar.

Boerner (F.). **Hexenbesen an Cedrus atlantica.** [Witches' brooms on *Cedrus atlantica*.]—*Mitt. dtsch. dendrol. Ges.*, xlvii (*Jb.*), p. 243, 1 fig., 1935.

Attention is drawn to the occurrence on a 7 to 8 m. high *Cedrus atlantica* in the Sanssouci Palace (Potsdam) gardens of a witches' broom, 50 cm. in diameter, of unknown origin. The so-called 'dwarf' varieties, e.g., of *C. libani* var. *nana*, are believed to arise through the use of portions of such excrescences for grafting purposes [cf. *R.A.M.*, xv, p. 68].

Remington (J. S.). **Some notes on wood preservation.**—*Paint Manuf.*, vi, pp. 8–10, 1936. [Abs. in *Chem. Abstr.*, xxx, 5, p. 1594, 1936.]

Following a brief discussion of various types of wood-rotting and their control by preservatives such as creosote, cuprinol [*R.A.M.*, x, p. 733], and synthetic resin varnishes, the writer draws attention to the widespread use as driers of several metallic naphthenates. A priming coat that limits fungal infection consists of 73 kg. 35 per cent. leaded zinc oxide [ibid., xv, p. 40], 9·1 kg. bleached diatomite, 18·9 l. raw linseed oil, and 3·8 to 4·7 l. white spirit containing 3 per cent. copper naphthenate.

Liese (J.). **Heutiger Stand der Holzkonservierung.** [The present status of wood preservation.]—*Z. angew. Chem.*, xlix, 1, p. 37, 1936.

Impregnation with coal-tar oil is stated to be widely used in Germany [*R.A.M.*, xv, p. 187] for railway sleepers, and in this connexion attention is drawn to the difficulty of reaching the heartwood in certain kinds of timber, e.g., pine, and to some recent technical improvements designed to overcome this resistance. In the kyanization process [ibid., xiii, p. 667], the layer of protective material deposited on the wood is only 2 to 5 mm. in thickness. The outcome of a three months' experiment in the fungal infection of wood so treated showed that, whereas the outer ring was practically sound, the inner ones as far as the heart had lost 25 to 50 per cent. of their initial weight. The protective action of this treatment, however, must not be underrated, the fibres becoming permeated with the mercuric chloride in such a way as to preclude leaching-out. The different woods vary in their capacity for adsorption of mercuric chloride, pine, for instance, taking up 122 per cent. of the solution (based on initial weight), while the corresponding figure for dried spruce is only 27 per cent. The replacement of mercuric chloride by the indigenous sodium fluoride is attended by certain disadvantages,

notably insufficient fixation by the wood and instability which may be remedied, however, by the addition of arsenic compounds and bichromates (the so-called 'U' salts) [ibid., xv, p. 333]. A prerequisite condition of impregnation by osmosis [loc. cit.] in the true sense is a semi-permeable membrane, which is not present in the dead cell walls of wood. There can thus be no question of osmosis, properly speaking, but merely of differences in the rate of diffusion of the salt molecules through the material. A definite conclusion as to the value of this method of treatment cannot be reached at present, whereas the efficacy of the 'U' salts is beyond dispute. It is important that freshly felled wood should be treated immediately after debarkation, and that, particularly in the case of pine, the solution should penetrate to an adequate depth, preferably under pressure.

RITMAN (E. H.). **Improved chemical wood preservation from use of chromated zinc chloride.**—*Agric. News Lett.*, iv, 1, pp. 2–5, 1936. [Mimeographed.]

From statistical data compiled during the past seven years it is computed that some 86 per cent. of the 184,000,000 cu. ft. 'salt'-treated timber in the United States was subjected to impregnation with zinc chloride. In this connexion attention is drawn to the recent development by the Grasselli Chemical Company, Cleveland, Ohio, in collaboration with the wood-preserving industry, of a superior, non-proprietary reagent known as Grasselli chromated zinc chloride. This product, which consists of a high-grade commercial zinc chloride and sodium dichromate of approved quality in appropriate combinations, is stated to compare favourably with heavy retentions of creosote oil [*R.A.M.*, xv, p. 269] in preservative value, while its physical permanence and maintenance of toxicity under outdoor conditions have been fully substantiated. Chromated zinc chloride can be used in any plant equipped for the 'vacuum-pressure' impregnation process, and has the further advantage of freedom from all toxic volatile organic chemicals so that it may safely be employed for domestic purposes.

HASSE (B.). **A new method for impregnation of wood.**—*Tidsskrift...*, xx, pp. 281–284, 1935. [Abs. in *Chem. Abstr.*, xxx, 1, p. 262, 1936.]

Logs in Scandinavia are treated for some hours with a solution of sodium arsenate at 82° to 84° C. to remove the air and water within them, after which the solution is cooled to between 75° and 80° and left for twelve hours. During this period partial penetration of the wood takes place. The warm solution is then pumped off and replaced by a cold solution of zinc chloride, which is left for twelve hours. This mixture also penetrates the wood and reacts with the sodium arsenate to form zinc arsenate insoluble in water. In this form the arsenic is toxic to all wood-destroying organisms [cf. *R.A.M.*, xv, p. 333] but not to man.

GUILBERT (F.). **Maladie du cœur de la Betterave.** [Heart rot of the Beetroot.]—*Bull. Ass. Chim. Sucr.*, liii, 1, pp. 23–30, 1 diag., 1936. **[English and German summaries.]**

In a case of heart rot of beets studied in 1934 in Seine-et-Marne [*R.A.M.*, xv, pp. 273, 337] the soil was found to contain a superabundance of lime (P_H 9). Seed-clusters infected by the pycnidia of *Phoma*

betae [ibid., xv, p. 337] did not necessarily develop the disease, but there is considered to be no doubt that the fungus aids in its establishment in soils of a favourable reaction. It is recommended that boron and humiferous manures be incorporated with the soil in quantities calculated to adjust the hydrogen ion concentration to P_H 7 [see next abstracts].

Crown rot in Sugar Beet.—*J. Dep. Agric. Irish Free St.*, xxxiii, 2, pp. 207–210, 1935.

In preliminary tests carried out at eleven centres in four counties in the Irish Free State, plots on which sugar beets had previously been attacked by crown rot were dressed (in addition to the usual manuring) with 10, 20, and 30 lb. per acre, respectively, of finely powdered borax [*R.A.M.*, xiv, p. 551], a further plot remaining untreated as a control. The application was made about the time the crop was sown or a few weeks afterwards. At four further centres where the disease had already appeared during the current season, 30 lb. of borax per acre was applied during mid-August.

The average returns from eight centres on which the disease developed showed that whereas the plots which received no borax yielded 6 tons 8 cwt. of roots per acre with a sugar-content of 16·2 per cent., the corresponding figures for those receiving 10, 20, and 30 lb. of borax per acre were, respectively, 9 tons 7 cwt. and 16·8 per cent.; 10 tons 17 cwt. and 17·7 per cent.; and 11 tons 5 cwt. and 17·8 per cent. In three centres where no crown rot developed none of the borax applications depressed either the yield or the sugar content. The average returns from the four centres where the disease had already appeared when the borax was applied showed that the 30 lb. applications increased the sucrose yield per acre by 70 per cent. While the P_H value of the soil at one centre was not ascertained, in four it was 5·8, 5·8, 7·85, and 7·7, respectively, and in all the others over 8. As a result of these tests, the application of borax at the rate of 20 lb. per acre is recommended as a preventive of crown rot on alkaline soils in affected districts [see preceding and next abstracts].

Boron and plant life.—*Fertil. Feed. St. J.*, xx, 25, pp. 720–724; 26, pp. 748–751, 1935; xxi, 1, pp. 4–6, 8; 3, pp. 60–64, 28 figs., 1 graph, 1 map, 1936.

Following an introductory account of the importance of boron in plant life, with bibliographical references, some outstanding recent work on diseases in which the absence of this element is involved is reviewed and discussed. The following items in the paper are of interest. According to R. Dietz (*Landeskultur*, ii, p. 161, 1935), the reclamation disease [*R.A.M.*, xv, p. 355] affecting barley, clover, potatoes, and turnips in Austria is due to the presence in the soil of iron in the ferrous state, a condition remediable by the application of boron, which oxidizes the harmful ferrous into the beneficial ferric iron. In a test on turnips suffering from heart and dry rot (regarded as a sequel to reclamation disease) the addition to the complete fertilizer of boric acid at the rate of 36 lb. per acre increased the yield (compared with that of the complete fertilizer plot) in two plots receiving this constituent by 70·4 and 67·5 per cent.

Prof. Oswald and his collaborators from the Swedish Agricultural Institute found that sugar beets are affected by heart rot [ibid., xv, p. 338] on 44 per cent. of the farms in the Karpalund district, where the estimated crop reduction from this cause is 12 per cent., involving a loss to the farmers of Kr. 60 (£3 2*s.*) per acre. In experiments on a farm where the disease was prevalent, the addition to the fertilizer of borax at the rate of 18 lb. per acre increased the beet yield from 9 tons 4 cwt. to 12 tons 4 cwt. per acre, the sugar content from 15·4 to 17·6 per cent., and the sugar yield from 1 ton 8 cwt. to 2 tons 3 cwt. Even on a farm where no symptoms of heart rot were present the addition of borax at the rate of 7 lb. 4 oz. per acre raised the beet yield by over 1 ton per acre. Generally speaking, the element should be applied at the rate of 9 lb. per acre on soils without heart rot and at 18 lb. where the disease is prevalent [see preceding abstracts].

In Denmark the attacks of heart and dry rot on beets were more severe in Lolland-Falster in 1935 than at any time during the last 17 years. At Hornum good results were obtained by the application of borax at the rates of 6¾ or 13½ lb. per acre and at Haarby by the same treatment at 13½ or 27 lb. per acre. The mottling of kohlrabi [ibid., xv, p. 189] commonly present in the Aabenraa district is ascribed by Ravn to boron deficiency.

Brown heart of swedes [ibid., xv, p. 188 and next abstract] was satisfactorily controlled in experiments conducted by E. A. Jamalainen (*Bull. St. agric. Res. Sta.*, Helsinki, Finland, 72, 102 pp., 1935) by the addition to the fertilizer of boric acid at the rate of 4½ or 7·2 lb. (equivalent to 6¾ and 11·1 lb. borax, respectively) per acre.

O'Brien (D. G.) & Dennis (R. W. G.). **Further information relating to control of raan in Swedes.**—Reprinted from *Scot. J. Agric.*, xix, 18 pp., 1 fig., 1 map, 1936.

The results of further experiments in the counties of Kirkcudbright and Dumfries on the control of 'raan' [or brown heart] in swedes [see preceding abstract] showed that the disease (which was incidentally observed also to affect yellow turnips) is completely curable by the application to the soil, just before sowing, of pure borax or terravit at the rate of 20 lb. per acre. Beneficial effects may also be conferred by the same treatment as late as August if the pre-sowing application has been omitted. Liming was found to aggravate the symptoms of boron deficiency, and where heavy applications of lime are essential for the control of club root [*Plasmodiophora brassicae*], a dressing of borax should also be given. Borax may not be mixed with any manure containing ammonia or any other ammonium salt, since the reaction thus set up involves the liberation and escape of the nitrogenous constituent.

Van Riemsdijk (J. F.). **Physiologische onderzoek van de 'vergelingsziekte' van Voederbieten en de schade door deze ziekte teweeggebracht.** [A physiological study of the 'yellowing disease' of Fodder Beets and the damage induced by this malady.]—*Tijdschr. PlZiekt.*, xli, 12, pp. 317–329, 1935. [French summary.]

An examination of beet leaves affected by 'yellowing' in Holland

[*R.A.M.*, xv, p. 191] showed the foliage to be shorter, less pointed, heavier, thicker, and more liable to rust (*Uromyces betae*) than that of healthy plants. The stomata of the diseased leaves open less widely than those of healthy ones. The leaves of yellowed plants exhale more carbon dioxide and contain a higher percentage of sugars (hexose, saccharose, and maltose) than those of sound ones and the absorption and transpiration of water is impeded in the former. The accumulation of starch, therefore, is a direct consequence of the stoppage in the transport of carbohydrates, which in its turn results from gummosis of the phloem [ibid., xiv, p. 210].

The average weights of the roots of 50 diseased and 50 healthy beets were 2,783 and 3,428 kg., respectively, the corresponding figures for leaf weight, dry matter, and sugar content being 0·876 and 0·756 kg., 11·9 and 12·7 per cent., and 6·2 and 7 per cent., respectively. Where half the crop is affected a 10 per cent. loss is experienced. Diseased plants behave like those with cut leaves, forming an abundance of heart leaves which contribute to the exhaustion of the root and retard recovery after transplantation. The striking correlations between beet yellowing and potato leaf roll indicate that a virus is implicated in the etiology of the former.

Van Schreven (D. A.). **De vergelingsziekte bij de Biet en haar oorzaak.** [The yellowing disease of the Beet and its cause.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 6, pp. 1–36, 7 figs., 1936. [French summary.]

Following an introductory note on the various physiological, fungal, and virus diseases liable to induce foliar chlorosis in the beet in Holland, the writer gives a tabulated account of experiments to determine the origin of 'yellowing', attributed in certain quarters to a physiological disturbance and in others to virus infection [see preceding abstract].

The possible influence of soil moisture on the course of the disease was investigated by (*a*) growing the plants in cement tubs at different ground water levels, (*b*) cultivation in pots with the soil (humus or quartz sand) kept at varying percentages of the water-holding capacity, (*c*) wounding the roots by various methods, and (*d*) growing the plants in the field on ridges or in the channels formed between the ridges. Some of the plants grown in trays under conditions of maximum humidity developed a form of chlorosis differing from any of those hitherto described, but with the onset of a sunny period the foliage resumed its normal colour. A compact habit of growth characterized the roots of plants growing under excessively humid conditions. In the pots in which the soil was maintained at only 5 or 10 per cent. of its water-holding capacity, the plants showed signs of wilting during warm weather and necrosis of the older leaves was accelerated. In dry weather wilting rapidly followed the transverse sectioning of the tap-root at a depth of 15 to 20 cm., and recovery was very slow. Inconclusive results were given by the field experiments in the ridge and channel methods of planting, the disease occurring sporadically in both lots.

In experiments on the transmission of the disease 36 plants remained healthy in cages on a soil in which the disease had often been observed in a virulent form. Positive results were obtained in attempts to transmit

the disease by means of *Aphis fabae* both from seed-bearers and plants in the open field, all the 35 plants inoculated contracting the symptoms. The older the plants the more tardy was the manifestation of yellowing, while in the case of seedlings the older foliage was the first to suffer. A retardation in the translocation of starch was observed in the diseased plants, as well as gummosis of the phloem. The average weights of 296 roots of yellowed and healthy plants were 146 and 191 kg., the corresponding sugar weights being 23·50 and 33·28 kg., respectively. The outcome of these experiments is considered to point to the implication of a virus in the causation of beet yellowing.

Skuderna (A. W.), Price (C.), Culbertson (J. O.), & Cormany (C. E.). **The curly-top resistant Beet variety.**—*Facts ab. Sug.*, xxxi, 1, p. 17, 1936.

In further extensive trials conducted with the curly top-resistant U.S. No. 1 beet variety [*R.A.M.*, xiv, p. 488] in 1934 in California, Idaho, and Utah, this selection produced on an average 13·35 tons of beets per acre compared with 5·47 for the ordinary commercial strains. In 11 test plantings in representative areas, the resistant variety produced 7·04 tons more beets, 0·30 per cent. higher sucrose, and 2,625 lb. more sugar per acre than the commercial brands used for comparison. Some 30,000 acres are stated to have been planted with U.S. No. 1 in 1934 and between 70,000 and 80,000 in 1935.

Scott (G. T.). **New curly-top resistant strains of Beets.**—*West. Irrig.* [*San Francisco*], xviii, 2, p. 7, 1936. [Abs. in *Facts ab. Sug.*, xxxi, 4, p. 151, 1936.]

The U.S. Nos. 33 and 34 sugar beet strains, derived by selection from the curly top-resistant U.S. No. 1 [see preceding abstract], are stated to show marked individual differences, the former being primarily of interest as a sugar-producer while the latter represents the yield type, being more vigorous and resistant. During the past season the average yields of U.S. Nos. 1, 33, and 34 in eight tests [? in California] under conditions involving severe exposure to curly top were 12·7, 15·6, and 17·9 tons per acre, the corresponding figures for sugar production being 17·6, 17·9, and 17·9 per cent., respectively.

Pierce (W. H.). **The identification of certain viruses affecting leguminous plants.**—*J. agric. Res.*, li, 11, pp. 1017–1039, 7 figs., 1935.

Following a brief reference to the confusion now existing in the classification of mosaic diseases affecting leguminous plants [*R.A.M.*, xv, p. 274] the author gives a fairly full account of his studies, for purposes of differentiation and identification, of the viruses obtained from various leguminous hosts which are described and classified by him under the designations common bean (*Phaseolus vulgaris*) mosaic (bean virus 1) [ibid., xv, p. 341], yellow bean mosaic (bean virus 2), white clover mosaic (white clover virus 1), enation pea mosaic (pea virus 1) [ibid., xiv, p. 486] (also described by M. W. Stubbs in an unpublished thesis, University of Wisconsin, 1935), common pea mosaic (pea virus 3), soy-bean mosaic (soy-bean virus 1) [*R.A.M.*, iii, p. 626], and a virus obtained from red clover (*Trifolium pratense*) producing local

necrotic lesions on the small-seeded broad bean (*Vicia faba* var. *minor*). Although admittedly preliminary, the results indicated from a practical standpoint that the most significant differences between the viruses are to be found in their host ranges and in the varietal susceptibility to them of peas and beans. The pea viruses 1 and 3 were shown not to be transmissible to beans by any of the methods tried, and were differentiated from each other on the basis of the varietal reaction to them of peas and upon differences in their host range, as well as by the fact that the first was infective to soy-bean but not the second. Bean viruses 1 and 2 are readily distinguished from each other by means of differential bean varieties, and the second was transmissible to certain varieties of peas. White clover virus 1 is characterized by its ability to infect all the varieties of beans and peas that were tested, as well as by the symptoms caused by it. The broad bean local lesion virus differed from all the other viruses in producing local necrotic lesions at the points of inoculation on the broad bean, and the soy-bean virus appeared to be specific to soy-bean, all the other host species being apparently immune from it. Slight differences were further noted in some physical properties of the various viruses, such as thermal death point and longevity *in vitro*. The thermal death point of bean virus 2 was determined as 58° to 60° C., of white clover virus 1 as 58°, pea virus 1 as 58°, pea virus 3 as 62° to 64°, and broad bean local lesion virus as 60° to 62°, the longevity of the viruses *in vitro* being 1 to 2 days, 6 to 7 days, 2 to 3 days, 2 to 3 days, and 2 to 3 days, respectively.

Böning (K.). **Versuche zur Bekämpfung der Fettfleckenkrankheit der Bohnen.** [Experiments on the control of the grease spot disease of Beans.]—*Prakt. Bl. Pflanzenb.*, xiii, 9–10, pp. 252–260, 1936.

Encouraging results were obtained in 1934 and 1935 at the Bavarian Plant Breeding and Plant Protection Institute, Munich, in experiments on the control of grease spot of beans [*Phaseolus vulgaris*], caused by *Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, xv, pp. 4, 191] by various methods of seed disinfection and treatment of the growing plants, the total yield of the treated plots exceeding that of the controls by more than two-thirds in the former and one-fifth in the latter year, while some four-fifths more healthy beans were obtained from the disinfected than from the untreated plots in both years. The variety used was the highly susceptible Harz Flageolet to which three treatments of 1 or 2 per cent. Bordeaux mixture or Wacker's and cusisa [ibid., xv, pp. 1, 324] dusts were applied in 1934 and two in 1935. In practice one timely application would probably suffice to control the disease. Seed disinfection with 0·125 per cent. ceresan (30 minutes' immersion), ceresan dust (0·5 gm. per kg.), and hot water (30 minutes at 45° C. or 10 at 50° [ibid., xi, p. 687] was only partially successful, the last-named being the most effective and reducing the incidence of infection from 79·1±13·7 to 34·2±7·5 per cent.

The results of varietal reaction tests largely confirmed those obtained by Stapp [ibid., xiv, p. 415] in respect of the great susceptibility of several Flageolet types (Red Paris, St. Andreas, Wachs Red), Metis, Incomparable, Wachs Mont d'Or, and Wachs Dattel. All the Saxa forms proved resistant, as also did Konserva, Unerschöpfliche [Inex-

haustible], several types of Hinrichs Riesen, Wachs Ideal, and Wachs Neger. The results with Karlsruhe Market, Kaiser Wilhelm, and Nordstern were conflicting and point, with other indications, to the possible existence within the pathogen of physiologic forms.

The outcome of experiments in the use of various combinations of fertilizers was of purely theoretical interest, the differences in the response of the plants being very slight, though in 1934 potash deficiency and an excess of nitrogen and phosphoric acid appeared to promote infection.

NOLL (J.) & SCHANDER (H.). **Beobachtungen über Schädigungen an Salat, insbesondere die Salatfäule, und Versuche zu ihrer Bekämpfung durch Bodendämpfung.** [Observations on injuries to Lettuce, especially Lettuce rot, and experiments on its control by soil steaming.]—*Obst- u. Gemüseb.*, lxxxii, 1, pp. 5–6, 5 figs., 1936.

In 1934, when late May frosts were followed by a protracted spell of heat and drought, the lettuce crops in the Zittau district of Saxony suffered severely from diseases, of which the most important was the rot caused by *Sclerotinia* (?) *minor* [*R.A.M.*, xii, p. 485; xiii, p. 241]. The fungus involves the sudden drooping and collapse of practically mature plants, the root collar and basal leaves of which are covered with a white mycelium which passes from plant to plant along the ground. Sclerotia are produced on the root collar. The treatment of the plants with quinosol [ibid., xiv, p. 641] was not ineffectual but had to be abandoned as uneconomic, while ceresan and potassium iodide gave unsatisfactory results. Excellent control was given, however, by steam sterilization of the soil (details of the process being reserved for future publication).

BAUDYŠ (E.). **Plíseň Locikova čili Salátová.** [Lettuce or salad mould.]—*Leták fytopath. sekce zemsk. výzk. Ust. zeměd.* [*Leafl. phytopath. Sect. reg. agric. Exp. Sta.*], 93, Brno, 2 pp., 1935.

A brief popular account is given of the morphology and biology of downy mildew of lettuce (*Bremia lactucae*) [*R.A.M.*, xiv, p. 683] which is stated to cause very considerable damage to the crop under glass in Czecho-Slovakia, as well as to certain other vegetables, such as globe artichoke [*Cynara scolymus*], chicory [*Cichorium intybus*], endive [*C. endivia*], and some ornamental plants of the Compositae (including cineraria) and weeds. For the control of the disease are recommended disinfection of the seed-bed with formalin or germisan, the application of potassium fertilizers and quicklime, and the removal of the infected lower leaves.

BÖNING (K.). **Düngungsmassnahmen zur Bekämpfung des Schwarzwerdens der Rettiche.** [Manuring methods for the control of Radish blackening.]—*Prakt. Bl. Pflanzenb.*, xiii, 9–10, pp. 252–260, 1936.

The results [which are fully tabulated and discussed] of experiments (in progress since 1932) at the Bavarian Plant Breeding and Plant Protection Institute, Munich, on the influence of manuring on black root of radishes [*Aphanomyces raphani*: *R.A.M.*, xii, p. 350] indicate the feasibility of control by the extended use of mineral fertilizers,

especially potash and nitrogen salts, in preference to stable manure, and tri- to quadrennial crop rotation. In one series of experiments in frames, treatment of infected soil with calcium cyanamide, ammonium sulphate (each at the rate of 120 gm. per sq. m.) and formalin (10 l. of 2 per cent. solution per sq. m.) completely controlled the disease, whereas the untreated soil gave 39 per cent. infection, and treatment with urea (50 gm.), quicklime (300 gm.), ceresan (10 l. of 0·25 per cent. and 0·5 per cent.), and Bordeaux mixture (1·5 l. of 2 per cent.), 3, 31, 28, 36, and 19 per cent., respectively. Both calcium cyanamide and formalin, however, checked the growth of the plants.

Dounine (M. S.), Zayantchkovskaya (Mme M. S.), & Soboleva (Mme V. P.). Болезни Топинамбура и меры борьбы с ними. [Diseases of the Jerusalem Artichoke and their control.]—*Тр. Всесоюзн. Науч.-Исслед. Инст. Зернобоб. Культур* [*Bull. Pan-Sov. sci. Res. Inst. for Leguminous Crops*], Moscow, vi, 1, pp. 7–13, 16–150, 46 figs., 1 diag., 1935. [English summary.]

In this general account of the diseases of the Jerusalem artichoke (*Helianthus tuberosus*) the authors state that white rot of the underground and aerial organs caused by *Sclerotinia sclerotiorum* [*R.A.M.*, viii, p. 155; xii, p. 571] is one of the major diseases of the crop in the central and northern provinces of the U.S.S.R., but much less important in the south. The morphology and biology of the fungus are dealt with in detail, and the fact was again confirmed that the ascospores play an important part in its dissemination. The temperature relations of *S. sclerotiorum* for growth were determined as follows: minimum near 0° C., optimum between 17° and 25°, and maximum between 32° and 34°. The optimum P_H value was 3·5 to 4·0, and the extremes P_H 2·3 and P_H 7·5. It was found that the disease is most severe in heavy, acid clay soils inclined towards swampiness, and could be minimized by draining and liming the soil.

Details are given of an important dying-off of the leaves and die-back of the shoots of the Jerusalem artichoke which was observed for the first time in the Moscow region in 1932. No pathogenic organisms were found in the tissues of affected plants, and the balance of evidence indicated that the trouble is of a physiological nature; it occurred chiefly on clay and sandy loam soils with excessive moisture, and the leaves of the diseased plants showed deficiency in phosphoric acid.

Brief descriptions are also given of the following diseases, which are also found in the U.S.S.R.: *Bacillus phytophthorus* [cf. ibid., xiii, p. 100]; *B. solanisaprus* [cf. ibid., x, p. 125]; *B. aroideae* [ibid., xv, p. 346]; an interveinal necrosis and a spotted chlorosis of the leaves, and a dot-like necrosis of the leaves due to an undetermined bacterium (these three diseases were of no economic importance); a blister-like puckering of the leaves, as well as curliness of the apical leaves, both due to viruses; and storage rots of the tubers, namely, the most important grey rot caused by *Botrytis cinerea*, and the soft rot due to *Rhizopus nigricans*.

The sunflower rust (*Puccinia helianthi*) [ibid., xv, p. 202] is known to attack the artichoke in the United States, but so far no biological race of this rust has been found capable of infecting this host in U.S.S.R., even when growing in close proximity to severely infected sunflowers,

though in one experiment Jerusalem artichoke plants raised from tubers that had been subjected to the action of X-rays were successfully and heavily infected with the rust. Careful searches for *Phymatotrichum omnivorum* [ibid., xi, p. 42] and *Sclerotium rolfsii* failed to reveal the presence of these fungi on Russian territory, and it is recommended that attempts be made to exclude these three diseases from the country by quarantine [ibid., xv, p. 400].

A complete list is given of all the bacteria (five) and fungi (32) recorded on this host. Control measures against all the diseases are discussed at length, and the bibliography at the end of the paper comprises 152 titles.

WAGER (V. A.). **Control of downy mildew in Cucumbers.**—Reprinted from *Fmg S. Afr.* [x], 3 pp., 5 figs., 1935.

Details are given of an experiment conducted at the sub-tropical Research Station, Nelspruit in 1934 on the control of cucumber downy mildew (*Pseudoperonospora cubensis*) [*R.A.M.*, xv, p. 197] which occurs almost invariably in the eastern Transvaal during the summer and early autumn when there are occasional rain storms and heavy night dews, entire plantations often being destroyed by the disease. Three cucumber plots were sprayed with Bordeaux mixture, three dusted with copper-lime, and six left untreated, each plot being $\frac{1}{24}$ acre in area. The seed was planted on 12th March and treatment began as soon as the plants appeared above the ground, the applications being repeated every ten days thereafter. The total yields of the sprayed and dusted plots were, respectively, 592 and 725 lb., the corresponding figures for the controls being 269 and 306 lb. The total cost of the treatment (including native labour) was 11*s.* 0*d.* and the value of the increase in yield £4 12*s.* 9*d.*, this being a net gain of over £4 for the $\frac{1}{4}$ acre treated. It is recommended that under local conditions cucumbers should be thoroughly dusted with copper-lime or Bordeaux dust immediately after rain storms and at least once a week thereafter.

KOCHMAN (J.). **Mączniak rzekomy Rabarbaru Peronospora jaapiana P. Magnus.** [Downy mildew of Rhubarb—*Peronospora jaapiana* P. Magnus.]—*Roczn. Nauk ogrod.*, ii, pp. 159–162, 1935. [English summary.]

The author states that downy mildew of rhubarb (*Peronospora jaapiana*) [*R.A.M.*, xiii, p. 762] was first recorded from Poland in Puławy in 1933, and in 1935 it appeared in epidemic form on rhubarb seedlings grown in cold frames in the neighbourhood of Warsaw. A brief morphological account of the fungus is given. Experiments on the control of the disease by spraying the plants with 1 per cent. Bordeaux mixture gave good results.

BENEMERITO (A. N.). **Mushroom culture in Canton.**—*Philipp. Agric.*, xxiv, 8, pp. 624–634, 5 figs., 1936.

A descriptive account is given of the cultivation in Canton, chiefly in the lowlands, of *Volvaria esculenta* [*R.A.M.*, xiii, p. 420], a species of mushroom widely distributed in the Philippine Islands. In Canton, the growing season lasts from March to September, the heaviest yields

being obtained in June and July, when the prevailing temperature is high; during winter the spawn is kept well protected from the cold. The beds, which are raised about 6 in. above the ground, are usually 20 to 25 ft. long by 2½ ft. wide, and there is a path 2 ft. wide between them. At one end of a row of beds a ditch about 2 ft. wide by 1 ft. deep is dug and the water allowed to flow into it in order to facilitate watering. As many as six layers of rice straw, each 3 in. or more thick and alternating with spawn, are laid down, the straw being trodden down by one man while another pours water over it. Finally, a cover of bundles of straw is placed on top and the whole copiously watered. After a week or so the bundles are removed, soaked in water, and untied, the straw being spread smoothly over the top of the bed, which is then sprinkled with water. After spawning, practically no further attention is given except to water the beds once a day when there is no rain.

Three crops are harvested during the season, each crop requiring 60 to 70 days to mature, though the first mushrooms may be gathered 16 to 20 days after spawning.

Dastur (J. F.). **Gram wilts in the Central Provinces.**—*Agric. Live-Stk India*, v, 4, pp. 615–627, 4 pl., 4 diags., 1935.

The author states that in the Central Provinces of India the most important diseases of gram (*Cicer arietinum*) are two different wilts, one of which is associated with a species of *Rhizoctonia* resembling *R. bataticola* [*Macrophomina phaseoli*: cf. *R.A.M.*, xv, p. 148], while the other has been shown by field experiments to be physiological in nature. Although the former attacks a wide range of gram varieties, only mature plants are affected and it causes less damage to the crop than the latter. Its first symptom is the bronzing of the leaves on one or more of the lower branches, the colour later changing to yellow and then to brown; the affected branches and leaf stalks are stiff and turned upwards, and the leaflets stand more or less vertically and are prematurely shed; the terminal parts of the tap-root and of the laterals are black or brown and shrivelled. The physiological wilt, on the other hand, is restricted only to certain gram varieties and may appear on the plants at any stage of their growth. The first symptom is the drooping of the tender apical parts with a slight loss of colour of the affected organs; later the plant exhibits distinct chlorosis, and its apical parts and leaves hang down limply. The latter are not easily shed, and with time the wilted plant may turn brown and continue to stand thus in the field for a long time. The root system does not show external signs of rot. In a large number of cases a species of *Fusarium* [ibid., xiii, p. 683] was isolated from the underground roots of a wilting plant, but all attempts to infect seedlings or plants with it through wounds or otherwise invariably gave negative results.

Fairly full details are given of varietal tests of gram which were carried out from 1927 to 1933, inclusive, in a field known to produce plants affected by physiological wilt at Pusa. Nagpur 28 selection gave a high yield but was most susceptible to wilt; a strain from Cawnpore proved very resistant but the yield was poor, while one from Karachi possessed considerable resistance and compared favourably with No. 28

in yield. The results showed clearly that in one part of the field the growth of certain varieties of gram was adversely affected, whereas in the other part these varieties may be safely grown. There was also evidence that the normal cultivation operations do not serve to disseminate the disease, indicating the non-infectious nature of the wilt.

The *Rhizoctonia*-wilted plants did not bear sclerotia, but these were found in pure cultures of the fungus; the sclerotia obtained from the strain isolated from plants of the Karachi variety of gram were much larger in size than those obtained from the strain isolated from the Cawnpore variety, and also differed from the latter in shape; the two strains of the fungus showed differences in growth on artificial media. Both strains failed to infect either wounded or unwounded gram plants in ordinary inoculation experiments, but produced distinct signs of infection when the experimental plants in pots were exposed to high temperatures (75° to 80° C.) for a few hours in the day for six or seven days.

Salmon (E. S.) & Ware (W. M.). **Department of Mycology.**—*J. S.-E. agric. Coll. Wye*, xxxvii, pp. 15–28, 1936.

Among many items of interest in this report the following may be mentioned:

Cladosporium fulvum [*R.A.M.*, xv, p. 407] was found on the cotyledons of recently potted tomatoes at Wye and the evidence indicated that the soil was the source of infection.

Pleospora pomorum [ibid., iv, pp. 226, 227, 421; v, p. 308] was obtained in culture from Bramley's Seedling and Cox's Orange Pippin apples rotting in storage. The fungus was also collected in April on overwintered apple leaves on which it had also been commonly observed in previous seasons.

The new virus disease of Fuggles hops recently reported [ibid., xiv, p. 423] was again noted. When the bines of the affected hills were just past the bar-string the dead or dying tips could be seen hanging away from the strings. The lower leaves of the bine were curled down and had very brittle petioles while leaves of the laterals showed a mosaic mottling. These symptoms are indistinguishable from those of mosaic as seen on Goldings and the Golding varieties but the disease appears late in the season and permits greater growth of the bine, while grafting experiments have shown that Fuggles hops can carry this virus (but not the mosaic virus) without manifesting any symptoms.

On 1st July Cobb's and Canterbury Golding hops from Selling showed a condition possibly due to a virus, and on 11th July a more serious outbreak was discovered at Teynbarn, where 10 to 20 per cent. of the hills in one 3-acre garden of Eastwell Goldings were found to be affected. Growth was checked and numerous long laterals developed from the bine from the breast wire to the bar-string. A yellowish or pale green blotching of the leaves of the main bine was often present. At the tip of the bine the stem was stiff and disinclined to climb, the internodes were short, the stipules were of normal size or elongated, but the leaves were small. These characters give a fluffy or feathery appearance to the tips, and the condition is accordingly designated 'fluffy tip'. The

cones appear to develop normally, but the arrested growth of the main bine and laterals very materially reduces yield.

Fuggles hops in one Kentish garden were slightly infected by *Sclerotinia sclerotiorum* [ibid., xiv, p. 792].

VOELKEL [H.] & KLEMM [M.]. **Die wichtigsten starken Schäden an Kulturpflanzen im Jahre 1935. (Beobachtungs-und Meldedienst der Biologischen Reichsanstalt.)** [The outstanding severe injuries of cultivated crops in the year 1935. (Observation and warning service of the Biological Institute.)]—*NachrBl. dtsch. PflSchDienst*, xvi, 1, pp. 5–10; 2, pp. 17–22; 3, pp. 27–34, 4 graphs, 39 maps, 1936.

Following a summary of the meteorological conditions prevailing in Germany during 1935 the writers give notes on the damage inflicted on cereals, potatoes, beets, fodders and meadow grasses, vegetables and miscellaneous commercial crops, and fruit by some well-known diseases and pests (the distribution of which is shown by maps) during that year [cf. *R.A.M.*, xiv, p. 424].

POLE EVANS (I. B.). **Pasture research and crop production. Annual report of the Division of Plant Industry.**—*Fmg S. Afr.*, x, 117, pp. 548–560, 2 figs., 1 map, 1935.

The following items of phytopathological interest, besides those already noticed from other sources, occur in this report [cf. *R.A.M.*, xiv, p. 426]. With the advent of flue-curing, tobacco mildew [*Erysiphe cichoracearum*: ibid., xiv, pp. 60, 533] has assumed some economic importance, since the most inconspicuous lesions are the cause of unsightly blemishes on the cured leaf. Leaf curl of tobacco [ibid., xiv, p. 678; xv, p. 118], like 'kromnek' [ibid., xiii, p. 401] (probably identical with spotted wilt) [ibid., xv, p. 324], is a disorder of erratic distribution. During the past season it was of rare occurrence in the eastern and western Transvaal but caused up to 100 per cent. loss in large plantings in the north. The whitefly vector [*Bemisia* sp.] overwinters on stump suckers and the disease is therefore largely controllable by destroying old stumps after harvesting.

No citrus canker [*Pseudomonas citri*] has been detected in the Union during the past seven years, and permission was granted in 1935 to plant in the quarantined area 9,740 trees and 91,700 seeds, and to bud 8,940. Five cases of scaly bark or psorosis [ibid., xiv, p. 426] were observed among the 7,310 trees inspected in the Cape Province and 330 out of 461,443 in the Transvaal.

Red locusts [*Nomadacris septemfasciata*] kept in captivity and inoculated with a species of *Beauveria* died after six to ten days [ibid., xii, p. 217], but field experiments were unsuccessful, and it is concluded that the fungus is only able to attack individuals weakened by adverse environmental factors.

An extreme type of mouldy core, caused by a species of *Penicillium*, was found in apples suffering from a form of internal breakdown [ibid., xv, pp. 299–302]. *Phoma* [*Mycosphaerella pomi*: ibid., xiv, p. 151] was reported to have caused 50 per cent. infection on apples still on the tree in one locality in the eastern Cape Province. Other records include

powdery mildew (*Oidium* sp.) of broad beans [*Vicia faba*] and *Macrosporium* leaf spot of chrysanthemum, groundnut, and watermelon.

HANSFORD (C. G.). **Annual Report of Mycologist, 1934.**—*Rep. Dep. Agric. Uganda for the year ended 31st December, 1934* (Part II), pp. 73–88, 1 graph, 1936.

Further investigations carried out in Uganda into blast (*Piricularia* sp.) of *Eleusine coracana* [*R.A.M.*, xiv, p. 81] showed that in culture the fungus was indistinguishable from one found on *Digitaria*. Inoculations made on unwounded *E. coracana* plants with both organisms gave only a very few positive results, indicating that special conditions are required for infection. Native seed supplies may carry the fungus on the surface and in the tissues; in the latter case the seedlings rarely survive more than a few days.

Two strains of *Helminthosporium* provisionally identified as *H. leucostylum* and *H. nodulosum* [ibid., xiv, p. 440] were isolated from *E. coracana*. The former often causes a seedling blight on this host, the plants withering and dying as a result of severe attack. Infection of the heads may result in a varying amount of partially filled grain, the affected ears usually showing a dark conidial growth. *H. nodulosum* caused a stem blight and foot rot of *E. coracana*. Infected plants develop a dark basal rot and dark areas on the culms and spots about 10 by 1 mm. in diameter. When basal infection occurs early in the season growth is retarded, and the plants often dry out completely before harvest, producing little or no crop.

Three types of groundnut (*Arachis hypogaea*) rosette [ibid., xiv, p. 739; xv, p. 277] are found in Uganda, viz., (1) typical 'rosette' with condensation of the stems and branches, (2) 'mottling' of the leaves, without marked yellowing or typical 'rosette' symptoms, and (3) 'yellows', a pronounced mosaic, the lighter areas varying from bright yellow to nearly white, no 'rosette' symptoms being present. The diseases distinguished as 'rosette' and 'yellows' have most effect on yield.

Cotton blackarm (*Bacterium malvacearum*) [ibid., xiv, pp. 97, 358], owing to alternating wet and dry periods during the 1934–5 season, attacked the plants with greater effect than usual. Much evidence is accumulating that blackarm is becoming increasingly important in some areas west of the Nile. Seed dusting with abavit B and abavit new very considerably reduced infection but gave no significant increase in yield. Wilt (? *Fusarium vasinfectum*) [ibid., xiv, p. 82; xv, pp. 149, 366] is increasing in parts of Buganda Province round Lake Victoria; west of the Nile it is common in the Mengo district and worst in Masaka, where plots showed over 20 per cent. infection. Some evidence was obtained that the disease is seed borne and can spread in infected debris from a previous crop. Many cotton plants affected with an *Alternaria* leaf spot [cf. ibid., xiv, pp. 629, 755] showed root infection by *Rhizoctonia bataticola* [*Macrophomina phaseoli*: see above, p. 423], a large proportion dying.

Cassava mosaic [ibid., xv, p. 277] has become of considerable importance in some parts of Uganda, where this crop forms a major reserve food supply of the natives. In the Teso district nearly 100 per cent.

infection is present on the long season variety, though the short season variety is much more resistant.

Sugar-cane red stripe (*Phytomonas rubrilineans*) [ibid., xv, p. 320] was heaviest on P.O.J. 2727, but also occurred on P.O.J. 2878, 2725, Uba, and other varieties. On one estate almost complete control resulted from roguing out affected canes with those attacked by mosaic. At present the predominating cane in Uganda is P.O.J. 2725, which is practically immune from mosaic and is more resistant to red stripe than other varieties.

EDSON (H. A.), MILLER (P. R.), & WOOD (JESSIE I.). **Diseases of plants in the United States in 1934.**—*Plant Dis. Reptr, Suppl.* 90, 135 pp., 12 graphs, 8 maps, 1935.

This report, prepared on the usual lines [*R.A.M.*, xiv, p. 348], contains an abundance of valuable information on the diseases of cereal, forage and cover, fruit and nut, vegetable, special, and sugar crops, trees, and ornamental plants in the United States during 1934.

PELUFFO (A. T.). **Uruguay: pests and diseases of plants.**—*Int. Bull. Pl. Prot.*, x, 2, pp. 29–30, 1936.

During 1934 *Plasmopara viticola* caused exceptionally heavy damage in Uruguayan vineyards, attacking not only the vines but the fruits; experiments in the control of the disease by a combination of Bordeaux mixture and ammonium chloride gave promising results. The same host was attacked by *Gloeosporium ampelophagum* [*Elsinoe ampelina*: *R.A.M.*, xv, p. 362]. Fruit trees suffered serious injury from gummosis [cf. ibid., xii, p. 575 *et passim*]. Pears were infected by *Venturia pirina*, quinces by *Stigmatea mespili*, and peaches by *Exoascus* [*Taphrina*] *deformans*. The most important wheat disease was loose smut (*Ustilago tritici*), infecting up to 30 per cent. of the crop.

MALLAMAIRE (A.). **French West Africa: cryptogamic diseases and phanerogamic parasites observed in Guinea.**—*Int. Bull. Pl. Prot.*, x, 2, pp. 25–26, 1936.

A list is given of some well-known fungous diseases affecting industrial trees and shrubs, fruit, cereals, and leguminous cover crops in French Guinea [cf. *R.A.M.*, xv, p. 79]. *Mycosphaerella manihotis* [ibid., xii, pp. 137, 552] is recorded as a parasite of cassava.

WALLACE (G. B.). **A root disease of Cacao (associated with Ustulina zonata Lev.).**—*E. Afr. agric. J.*, i, 4, pp. 266–268, 2 figs., 1936.

Cacao and kapok [*Eriodendron anfractuosum*] growing together on a plantation in the Usambara mountains, Tanganyika Territory, have for some years been affected by a disease associated with *Ustulina zonata* [*R.A.M.*, iv, p. 333]. The diseased cacao trees somewhat resemble trees affected by *Armillaria mellea*; the leaves droop, turn yellow and brown, drop off, and are not replaced. The roots, however, show no rhizomorphs or cracking and no mushroom odour is present. Black lines develop in the wood, and a feathery mycelium is abundantly present under the bark and as layers in the bark tissue. The fructifications occur on the bark of the collar and sometimes on exposed roots. It is

thought that the fungus may have been present only as a secondary invader since in the same plantation dead cacao trees were found showing no trace of any parasite. It is recommended that all dead and unthrifty trees should be removed with as much of their roots as possible.

KOEHLER (B.). **Seed treatments for farm crops.**—*Circ. Ill. agric. Exp. Sta.* 444, 19 pp., 10 figs., 2 diags., 1936.

The information here presented in a popular form on the treatment of cereal seed-grain by chemical disinfectants is stated to be based largely on the recommendations already given in a bulletin of the Illinois Agricultural Experiment Station [*R.A.M.*, xv, p. 346]. Details are given of the construction and application of a small gravity treater consisting of a series of three vertically arranged funnels, with perforated cones between them, the lowest funnel leading into a sack at the base. While one man slowly pours 1 bush. of seed-grain into the topmost funnel, another gradually introduces ½ oz. ceresan immediately above the centre of the funnel. Treatment can be applied much more rapidly (though less thoroughly) by this apparatus than by the ordinary barrel mixer, and furthermore the diffusion of dust is obviated by the close connexion between the spout of the funnel and the sack at its base.

DAVYDOFF (P. G.). Новая комбинированная протравливающая машина Борггардта. [Borghardt's new combined seed treating machine.]—*Pl. Prot. Leningrad, 1935*, 1, pp. 139–143, 5 figs., 1935. [Received May, 1936.]

A brief technical description is given of the construction (on the plans suggested by Prof. Borghardt) and working of a new hand-driven apparatus, adapted for the dust, semi-dry, and liquid disinfection of cereal seed-grain, and in which the admission of the fungicidal dust or liquid is automatically controlled by an easily adjustable contrivance. Its output is claimed to be 771, 504, and 703 kg. oats per working hour for the dry, semi-dry, and liquid treatments, respectively, and 3,229 kg. wheat and 1,700 kg. barley for dusting.

GORDON (W. L.). **Species of Fusarium isolated from field crops in Manitoba.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 298–299, 1935.

A tabulated list is given of 20 species, varieties, and forms of *Fusarium* (representing seven sections of the genus) which were isolated in 1932 from cereal crops in Manitoba, approximately 85 per cent. of the isolations being accounted for by *F. herbarum* var. *avenaceum* (predominant on common and durum wheat, barley, and rye), *F. equiseti* f. 1, *F. oxysporum* var. *aurantiacum*, and *F. culmorum* (more frequent on oats than any other species). These findings indicate that in that year comparatively few species of *Fusarium* were commonly associated with root and foot rots of cereals in Manitoba. [This article, and others from the *Proc. World's Grain Exhib. Conf.* are reprinted, without change of pagination, in *Proc. Canad. phytopath. Soc. 1935*, 3, 1935.]

GREANEY (F. J.). **Method of estimating losses from cereal rusts.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 224–238, 10 graphs, 1935.

Details are given of a method which was used during the sulphur-dusting experiments in Manitoba for the prevention of cereal rusts (*Puccinia* spp.) [*R.A.M.*, xiii, pp. 499, 618] to correlate rust infection and the yield of the various plots of standard varieties of wheat and oats attacked by stem [black] rust (*Puccinia graminis*), as well as rust infection and the specific gravity of the grain per measured bushel. The results showed that the relation of regression of yield, and of weight per bush. to percentage stem rust was linear, indicating that uniform increases in rust result in uniform reductions in yield and grain quality. This method allowed of determining percentage-loss values, giving the reduction in yield and in grain quality for each 10 per cent. increase of rust for the standard wheat and oat varieties tested, and these values were then used in calculating, on the basis of acreage, yield, and price statistics, the annual losses due to black rust in Manitoba and Saskatchewan. The resulting estimates indicated that during the eight years from 1925 to 1932 the average annual losses in these two provinces in wheat were 15·5 per cent. of the crops, representing an annual loss of 37,396,000 bush. of wheat (valued at $35,438,000); and 11·1 per cent. in oats (during 1930 to 1932 only), representing 13,525,000 bush., valued at $2,624,000. Even in the so-called 'non-rust' years rust caused quite a substantial loss.

POPP (W.). **A preliminary study of the reactions to stem rust of certain Wheat varieties in different stages of development.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 238–243, 1935.

A summarized account is given of preliminary greenhouse experiments, in which the reactions were tested of the wheat varieties H–44–24, Acme, and Marquis at various stages of their development to stem [black] rust (*Puccinia graminis tritici*) form 21, and also of H–44–24, Hope, H–44–24×Marquis R.L. 450, H–44–24×Marquis R.L. 204, Marquis, Reward, and Quality to form 15 [cf. *R.A.M.*, x, p. 170; xv, p. 348]. In all these varieties the first three leaves to develop proved susceptible to the form used. In H–44–24, Hope, Acme, and H–44–24×Marquis R.L. 450 each new leaf from the fourth onwards, when fully expanded, is more resistant than the preceding, and resistance in these leaves increases with their age; by heading time all the leaves from the fourth are practically immune. In the remaining varieties the leaves, leaf sheaths, and peduncles retain their susceptibility to the rust until they begin to lose their green colour. In H–44–24 portions of the leaf sheaths that become temporarily exposed during growth are susceptible, while the parts generally exposed are highly resistant.

Histological studies showed that in the varieties H–44–24, Acme, Marquis, Reward, and Quality, the proportion of sclerenchymatous to collenchymatous tissue increases in each consecutive leaf from the second to the topmost, and while in H–44–24, Hope, and Acme the sclerenchymatous tissue restricted to some extent the spread of the rust mycelium in the tissues, it is not considered that resistance can be solely attributed to the mechanical obstruction offered by this tissue.

Anderson (J. A.). **Studies on the nature of rust resistance in Wheat. VII. Chemical analyses of hybrid lines of Wheat differing in their rust reactions.**—*Canad. J. Res.*, xiv, 1, pp. 1–10, 1936.

In further studies of the nature of the resistance of wheat to black rust [*Puccinia graminis*: *R.A.M.*, xiv, p. 293] chemical analysis was made of the leaves during the seedling stage and after heading of twelve hybrid lines (pure for rust resistance only) from a Marquis×H–44–24 cross which fell into the four classes RR, RS, SR, SS, the first letter indicating the resistance or susceptibility of the seedling and the second that of the mature plant. The four classes of wheat proved to be very similar in composition at each of the two stages of growth and though significant differences occurred between the wheats in many of the fractions, no relationship was found between any fraction and either type of rust reaction. Though only negative results were obtained the investigation is considered to mark the first step in a logical, chemical investigation of the rust problem, preparing the way, as it does, for more detailed studies of the possible relations of individual constituents of the wheat leaf to rust reaction.

Johnson (T.) & Newton (Margaret). **Hybridization between Puccinia graminis tritici and Puccinia graminis avenae.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 219–223, 1 pl., 1 graph, 1935.

In continuation of their studies on specialization and hybridization in *Puccinia graminis* [*R.A.M.*, xii, p. 14; xiv, p. 500], the authors give a brief account of a new hybrid form of the rust which they obtained by fertilizing pustules of *P.g. tritici* form 9 on the barberry with nectar from a pustule of *P.g. avenae* form 6. The new form was shown to be pathogenic, although less severely than *P.g. tritici* form 9, to a number of wheat varieties, including Liguleless and Little Club; to the three barley varieties (Success, Manchurian, and O.A.C. 21) tested; and to the four oat varieties Victory, White Russian, Richland, and Joanette Strain (although to a somewhat more limited degree than the *P.g. avenae* form 6), as well as to *Agropyron tenerum* and *Hordeum jubatum*, thus presenting a combination of the pathogenic properties of its two parents. The work, however, gave clear evidence of a low degree of inter-fertility between the *P.g. tritici* and *P.g. avenae* races. So far no crosses of the two have been found in nature.

Hanna (W. F.) & Popp (W.). **Experiments on the control of loose smut of Wheat by seed treatment.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 243–248, 1 graph, 1935.

The results of the small-scale experiments reported in this paper showed that loose smut [*Ustilago tritici*: *R.A.M.*, xiv, p. 745] in Reward wheat was completely controlled by steeping the seed-grain, pre-soaked for four hours, for 10 minutes in hot water at temperatures between 125° and 129° F. without undue injury to the seed, and that the germinability of the treated seed was improved by dusting it after drying with copper carbonate. At temperatures above 130° the viability of the seed was seriously impaired. The smut was not controlled by heating naturally infected Reward wheat in an electric oven at 212° for

30 minutes, and control was not perfect by drying pre-soaked infected seed for 60 minutes at 150°. Of a number of chemical substances that were tried in aqueous solutions at room temperature none was found to be effective, except a 2 per cent. solution of potassium iodide, which considerably reduced the amount of loose smut in Reward and Ceres wheats, but did not give perfect control.

Zalessky (V.). Метод анаэробиоза для борьбы с пыльной головней Пшеницы. [Anaerobic method for the control of loose smut of Wheat.]—*Pl. Prot. Leningrad, 1935*, 1, pp. 135–138, 1935. [Received May, 1936.]

The method briefly described in this paper for the control of wheat loose smut (*Ustilago tritici*) [see preceding abstract] is stated to have been suggested to the author by observations which indicated that the parasite is considerably more susceptible than the wheat grains to the lethal action of anaerobic conditions. In a small range of experiments in 1933 it was found that no smut resulted in the progeny of lots of 100 to 200 grains of the soft wheat Lutescens No. 062 which were kept for 18 to 24 hours entirely submerged in a flask in water deprived of its oxygen (either by distillation or by boiling) at 25° C., whereas the controls gave 24·5 per cent. smut, while in a similar lot of hard wheat (Albidum No. 0721) the percentage of resulting smut was reduced from 28 to 1·5. Saturation of the water with carbon dioxide slightly reduced the efficacy of the treatment. The method is still in the experimental stage and is not recommended for general practice until it has been further tested.

Mitra (M.) & Taslim (M.). **The control of loose smut of Wheat in North Bihar by the solar energy and sun-heated water methods.**—*Agric. Live-Stk India*, vi, 1, pp. 43–47, 1936

Experiments conducted during 1934–5 showed that both the solar energy and sun-heated water methods recommended by Luthra and Sattar for the control of loose smut of wheat [*Ustilago tritici*: *R.A.M.*, xiv, p. 22 and preceding abstracts] are applicable under North Bihar conditions. Absolute control was given by both treatments, the former involving exposure of the Punjab S.A. seed-grain after four hours' presoaking to the direct rays of the sun from noon till evening and the latter its immersion for the same length of time in water previously warmed by the sun, whereas in the untreated plots the incidence of infection ranged from 1·54 to 2·03 per cent. The seed-grain should be treated after harvesting, well dried, and stored in air-tight containers.

Moore (M. B.). **Pathogenicity of different collections of Ustilago tritici and U. nuda.**—Abs. in *Phytopathology*, xxvi, 2, p. 103, 1936.

Each of 12 collections of spore material of *Ustilago tritici* from Minnesota, North Dakota, Texas, and Mexico was inoculated by the partial-vacuum method into 6 to 8 heads of each of 9 differential wheat varieties, with the result that 5 parasitic races could be distinguished on the basis of the amount of infection caused, generally either 0 or between 20 and 100 per cent. according to the strain of smut used [cf. *R.A.M.*, xiv, p. 620]. In the case of *U. nuda* on barley [ibid., xv, p. 288]

the outcome of the inoculation tests was less clear-cut, but the Trebi variety showed a high degree of resistance to the 9 collections used.

New applications are found for superphosphate.—*Industr. Engng Chem.*, News Ed., xiii, 20, p. 406, 1935.

Information has been received from the Research Institute for Fertilizers and Insectofungicides (U.S.S.R.) that double superphosphate from apatite and thermic phosphoric acid with a total content of 50·17 per cent. phosphoric acid give satisfactory control of millet [*Panicum miliaceum*] and wheat smuts [*Ustilago panici miliacei* and *Tilletia caries* and *T. foetens*, respectively: *R.A.M.*, xv, pp. 285, 360], when dusted over the seed grain at the rate of 6 gm. per kg. In field tests the incidence of infection by these diseases was reduced from 30 per cent. to nil. Germination was somewhat impaired in the case of wheat only.

Vanterpool (T. C.). **Toxin formation by species of Pythium parasitic on Wheat.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 294–298, 3 figs., 1935.

A summarized account is given of experiments with species of *Pythium* associated with browning root rot of wheat in Canada, but chiefly with *P. arrhenomanes* var. *canadensis* [*R.A.M.*, xiii, p. 758; xv, p. 141], the results of which showed that these fungi, when grown on specific culture media, are capable of excreting toxins which inhibit the germination of wheat and other cereals, and cause a pronounced black discoloration of the grain. The toxic principle was shown to be thermostable; it was removed almost completely by the soil in pot cultures of the hosts, but was still effective after filtration through a 10 cm. column of loamy earth. There was evidence indicating that the principle is toxic to the cytoplasm of the host tissues, but is not able to dissolve the cell walls. It readily caused wilting of tomato plants, but did not inhibit the growth of the fungus on agar. Mycelial extracts, on the other hand, showed no definite toxicity to wheat. Substances toxic to wheat were also shown to be produced on specific media by *Ophiobolus graminis* and, to a less extent, by *Helminthosporium sativum* and *Fusarium culmorum*.

In comparative pathogenicity tests of the wheat foot rot organisms care should be taken to inoculate the soil with cultures of media on which toxins are not produced by the fungi concerned.

Mead (H. W.). **Seed injury in Wheat and infection by Helminthosporium sativum P., K., & B.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 278–282, 1935.

Greenhouse and field experiments in 1932 at Saskatoon and Muenster, Canada, showed that wheat (Marquis and Reward) seed-grain injured naturally by frost, rust [*Puccinia* spp.], sprouting, or drought, or artificially by formalin treatment, and inoculated before sowing with *Helminthosporium sativum* [*R.A.M.*, xv, p. 86], produced plants which exhibited greater losses from non-emergence and blighting, and considerable reduction in yield, than plants raised from normal seed of the same varieties, inoculated with the same fungus. Reduction in stand and yield also resulted from sowing injured seed-grain without inocula-

tion. The practice is recommended of sowing sound seed as early as possible in soils commonly infected with *H. sativum*.

GLYNNE (MARY D.). **Some new British records of fungi on Wheat. Cercosporella herpotrichoides Fron, Gibellina cerealis Pass., and Ophiobolus herpotrichus (Fr.) Sacc.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 120–122, 1936.

In 1935, *Cercosporella herpotrichoides* [*R.A.M.*, xv, p. 352] occurred on wheat at Rothamsted, the disease being fairly common and present on every plot in a field planted every year to wheat since 1843. It was also found occasionally in other fields where wheat is grown in rotation with other crops. This accords with the general view that the disease increases when rotation is inadequate. On potato dextrose agar, the fungus formed hemispherical mounds of grey, velvety mycelium with a pale edge, later growing out over the agar rather slowly and becoming darker on the under surface.

Gibellina cerealis [ibid., xiv, p. 26] was found in May at Rothamsted in a plot where wheat has alternated with fallow without manure since 1856. The fungus caused rotting of the tillers and stunting of the shoots, and was characterized by dark-bordered, elongated lesions on the lower leaf sheaths and basal parts of the culms with a greyish-white mycelial felt penetrating and uniting the leaf sheaths, and developing into a stroma with darker cells below. Numerous pale perithecia with black, protruding beaks were embedded in the stroma and ripened from June onwards. The perithecia measured 315 to 600 by 285 to 570 μ and the beak 285 to 455 by 125 to 220 μ, the asci 90 to 125 by 13 to 18 μ, and the uniseptate, hyaline, later honey-coloured to hazel and rarely biseptate ascospores from 23 to 36 by 7 to 11 μ. Paraphyses were present. Cultures on potato dextrose agar developed as white mounds which later sometimes turned pale grey; numerous fertile perithecia developed in cultures about five weeks old.

Ripe perithecia of *Ophiobolus herpotrichus* [ibid., xiv, pp. 124, 569] were found at Rothamsted in March on wheat stubble overwintered in the soil. No evidence of parasitism was obtained. Cultures on potato dextrose agar were whitish-grey or brownish, often showing dark and light areas. In Great Britain the fungus has been recorded on wild grasses, but not before on wheat.

DASTUR (J. F.). **Microscopic characters of the black point disease of Wheat in the Central Provinces.**—*Proc. World's Grain Exhib. Conf.*, *Regina*, ii, pp. 253–255, 1 fig., 1935.

The author states that a condition of wheat grains closely resembling that described as black point in St. Martin Argentine wheat by Pasinetti in 1931 [*R.A.M.*, xi, p. 100] occurs in the Central Provinces of India. The only important point of difference is that while no organisms were found by Pasinetti in the discoloured grains, bacteria and species of *Helminthosporium*, *Cladosporium*, *Ophiobolus*, and *Fusarium* were shown to be present in the Indian wheats, even though seed-grain thus affected may germinate, in the majority of cases, and produce normal plants. In a few cases, however, black-point wheat grains failed to show the presence in them of any organism, independently of whether they

germinated normally or not at all. Hyphae were observed inside the affected grains in great abundance in the funicle and in the pericarp in the central region of the grain furrow; they creep between the pericarp and the seed coat, where they form a kind of stroma, and also occur in the coleoptile and in crushed cells behind the scutellum. No evidence of mycelium was found in the embryo, aleurone layer, or starch cells of the endosperm.

Reed (G. M.) & Stanton (T. R.). **Reaction of Oat varieties to physiologic races of loose and covered smuts of red Oats.**—*J. agric. Res.*, lii, 1, pp. 1–16, 1936.

A tabulated account is given of experiments from 1931 to 1934, inclusive, at Brooklyn, in which the reaction was tested of 34 strains or varieties of eight species of *Avena* to five collections of covered smut (*Ustilago levis*) [*U. kolleri*] (four from Fulghum oats [*R.A.M.*, xi. p. 506; xiv, p. 574] in Georgia and South Carolina, and one from Black Mesdag in North Dakota), and to nine collections of loose smut (*U. avenae*) [loc. cit. and ibid., xv, p. 354] from the southern oat-growing area of the United States, collected on four varieties, including Fulghum. The Fulghum races of both species showed very distinct differences in their reaction on the various oat varieties tested. Both groups severely attacked the strains of Fulghum but were negative on certain other varieties, such as Navarro and Red Rustproof; they also attacked severely some varieties of the *Avena sativa* group, while other varieties were completely resistant to loose smut but susceptible to the covered smut. Generally speaking, all the collections were very similar in behaviour on many oat varieties, but some evidence was obtained indicating that specialized subraces may exist. A strain of loose smut occurring on Red Rustproof was shown to be distinct from the others, and Canadian (a variety of *A. sativa*) and strains of *A. fatua* and *A. strigosa* were shown to be susceptible to it. Markton and Navarro oats stood out by their complete resistance to all the collections of the two species of smut.

Der Schneeschimmel. [The snow fungus.]—*Landwirt, Novisad*, iv, 3, p. 22, 1936.

A popular note is given on the occurrence and control of the snow fungus (*Fusarium* spp.) [including *Calonectria graminicola*] of winter cereals, especially rye, in Jugo-Slavia. The damage from this source may be mitigated by breaking up the snow cover to admit air to the plants, accelerating the process of thawing and simultaneously providing a good potash manure by strewing wood ash over the surface, and (in the absence of snow) applying a top dressing of calcium cyanamide at the rate of 50 kg. per Joch [1·42 acres].

Ivanoff (S. S.) & Riker (A. J.). **Genetic types of resistance to bacterial wilt of Corn.**—Abs. in *Phytopathology*, xxvi, 2, pp. 95–96, 1936.

The existence of three types of resistance to bacterial wilt of maize (*Phytomonas* [*Aplanobacter*] *stewarti*) [*R.A.M.*, xv, p. 282] has been revealed by extensive studies on Golden Bantam inbreds and F_1 hybrids, various commercial crosses, and open-pollinated sweet, dent,

and flint types, viz., vigour-correlated (vigour measured by height), lateness-correlated, and 'true' resistance. Generally speaking, hybrids produced from low-resistant inbreds showed less resistance than those derived from high-resistant ones, but the degree of resistance in the former was greater than that of either of the parents; hybrids from high-resistant inbreds were approximately equal in resistance to their parents. On the whole hybrid resistance seems to be mainly influenced by the resistant parent. Open-pollinated sweet corn varieties showed about the same degree of resistance as the comparable dent and flint types.

Hirschhorn (Elisa) & Hirschhorn (J.). **Los carbones del Maiz en la Argentina. Carácteres sistemáticos, genéticos y parasitarios. (Observaciones preliminares.)** [Maize smuts in the Argentine. Systematic, genetic, and parasitic characters. (Preliminary observations.)]—*Rec. Fac. Agron. La Plata*, xx, 2, pp. 108–139, 4 pl., 1935. [English summary. Received March, 1936.]

Maize smut in the Argentine has hitherto been attributed exclusively to *Ustilago zeae* [*R.A.M.*, vii, p. 796] and *U. abortifera*, described by Spegazzini from Salta in 1881 and not observed since, but the authors' extensive studies on the systematic position, biology, and pathogenicity of diseased material from 22 localities, together with samples from Uruguay and Venezuela, revealed an extremely complex situation. The affected organs and the smut galls were found to contain a mixture of chlamydospores of *U. zeae* (predominating), *Sorosporium reilianum* (only in one sample in a pure state) [ibid., xv, p. 360], and *U.* (?) *fisheri*. The results of inoculation experiments with the progeny of a phenotype of *S. reilianum* clearly established the hybrid character of the smut by demonstrating the segregation of typical chlamydospores of the three smuts with others of an intermediate character, suggesting the possibility of spontaneous crossing. Chlamydospore production in *U. zeae* was more rapid than in *S. reilianum*; the chlamydospores of the latter formed on potato dextrose agar failed to germinate in a moist chamber. The suspected identity of *U. abortifera* with *S. reilianum* was confirmed by comparative studies.

Elliott (Charlotte), Melchers (L. E.), Lefebvre (C. L.), & Wagner (F. A.). **Pythium root rot of Milo.**—Abs. in *Phytopathology*, xxvi, 2, p. 92, 1936.

The fungus responsible for the root rot which has been causing heavy damage to milo sorghums in the south-western United States during the last ten years [*R.A.M.*, xi, p. 507] has been identified as *Pythium arrhenomanes* [ibid., xv, p. 141]. The kafir and sorgo types tested for their reaction to the disease are resistant or immune, while resistant strains have also been developed from susceptible milos.

Jenkins (Anna E.). **Australian Citrus scab caused by Sphaceloma fawcettii scabiosa.**—*Phytopathology*, xxvi, 2, pp. 195–197, 1 fig., 1936.

An examination of citrus scab material from Queensland dating from 1876 and labelled (probably by McAlpine) *Ramularia scabiosa* showed

the fungus concerned to be identical with that on a similar specimen from New South Wales and closely related to *Sphaceloma fawcettii* [*R.A.M.*, xv, p. 362], from which it differs, however, in its larger conidiophores and greyish, hair-brown or fuscous conidia (10 to 17 by 2·5 to 5 μ). The lesions produced by the Australasian fungus are also larger and more regularly discoid or crateriform than those of the Florida disease. Pending further investigations the name of *S. fawcettii scabiosa* is suggested for *R. scabiosa*. The Queensland record is stated to be the first definite one of a *Sphaceloma* disease of citrus in any country.

VENKATARAYAN (S. V.). **The biology of Ganoderma lucidum on Areca and Cocoanut Palms.**—*Phytopathology*, xxvi, 2, pp. 153–175, 6 figs., 1936.

The inoculation of sterilized fragments of *Areca catechu* tissue with pure cultures of *Ganoderma lucidum* [*R.A.M.*, xiv, p. 693; xv, p. 78] from the same host in Mysore resulted in the development of sporophores with true pilei. The fungus was found to secrete diastase, laccase, invertase, protease, coagulase, rennetase, and oxidase. The decay induced by *G. lucidum* is of the 'brown rot' or 'destruction' type [ibid., ix, p. 150], but a transition to the 'corrosion' phase is indicated by the capacity of the organism for tannin utilization. The growth range of the pathogen was found to extend from P_H 3 to 7 with an optimum at P_H 6·5.

The parasitism of *G. lucidum* appears to be of a very gradual order. Large pieces of inoculum cultivated on *Cassia siamea* roots were placed in proximity to living areca palms, the roots of which were found five months later to be permeated and discoloured. Inoculations of four coco-nut palms through holes bored in the trunk with the fungus from this host caused the typical bleeding (though but slightly developed) within six months, whereas the control trees were unaffected.

JURION (F.). **La brûlure des Caféiers.** [Coffee black tip.]—*Publ. Inst. nat. Étud. agron. Congo belge, Sér. Sci.* 6, 19 pp., 29 figs, 4 graphs, 1936.

Coffea arabica growing on mountains of 2,000 to 2,100 m. and in valleys of 1,650 to 1,750 m. elevation in the Belgian Congo is affected by a physiological disease 'black tip' (also recorded by A. D. Trench from Kenya under the name 'hot and cold disease'—*Kenya Bull.* 14, 1932) characteristic of these localities, which are subject to sudden drops in temperature and heavy humidity, factors seldom obtaining at intermediate altitudes (1,800 to 1,900 m.). The affected trees appear as if frost-bitten; most of the leaves and unlignified shoots are destroyed, and after the death of the terminal buds the trees assume a stunted aspect, the internodes being very short, while an enormous number of secondary branches is formed.

The process by which black tip becomes established is as follows. At sunrise sudden evaporation takes place from the cold, dewy leaves which still further reduces their temperature. When temperature suddenly rises, as it does a little later, conditions are set up in the leaves resembling those due to the effects of frost followed by rapid thawing on living tissues. The succeeding intense transpiration due to heat

destroys the turgescence necessary to the life of the cell and the tissues become burned and die.

The effect of shade is to reduce sudden variations in temperature and in the rainy season to reduce the formation of dew during the night. To be effective the shade must be flat and very regular, without gaps. Rapidly growing shade trees should be planted before the coffee. Resistant types of coffee (viz., those with brown shoots) may be planted with seed taken from resistant but not immune types, the latter lacking resistance to drought.

Progress Reports from Experiment Stations, season 1934–1935.—v+144 pp., 19 graphs, 1 plan, London, Empire Cotton Growing Corporation, 1936.

This compilation of reports for 1934–5 from the various stations of the Empire Cotton Growing Corporation [cf. *R.A.M.*, xiv, p. 357] contains, *inter alia*, the following items of phytopathological interest.

In experiments at Barberton, South Africa, on the insect transmission of internal boll disease (*Nematospora gossypii*) [and *N. coryli*: loc. cit], samples of stainers (*Dysdercus* spp.) collected each week from *Sterculia* trees were tested on sterile cotton bolls. Adults of *D. nigrofasciatus* and *D. intermedius* from both the migrant and F_1 generation on the trees were found to be carrying *N. gossypii*, 13 per cent. being infected. *Sterculia* fruits showed *N. gossypii* abundantly present inside the seed. Adults of *Odontopus confusus*, an insect very commonly associated with *S. rogersii*, were found to be heavily infected with *N. gossypii*, and as the insect passes its whole existence on the tree it may possibly carry over infection from one season's fruit to the next.

In Tanganyika Territory internal boll disease [*N. gossypii* and *N. coryli*: ibid., xiv, p. 97] was present in all the local cotton-growing areas, though the Moshi area was exceptionally healthy.

A wilt extensively present in two cotton fields at the Magut experiment station, Natal, and which had affected only an occasional plant during the two preceding seasons, was caused by a species of *Verticillium* recorded from America [ibid., xiv, p. 629] and from Cape Province. The two affected fields were not adjacent and were planted with different strains of cotton; when identical seed was planted in other parts of the station no disease appeared.

In further breeding work in the Sudan against blackarm (*Bacterium malvacearum*) [ibid., xiv, p. 358] trials with new hybrids from Nye's Uganda types, crossed with 513 and 514, showed the F_1 plants to be intermediate in resistance, the 513 hybrids being appreciably more resistant than the 514 hybrids. Families from the resistant parents retained their resistance.

In breeding experiments at Serere, Uganda, despite very heavy blackarm infection on the control rows of S.G. 29, many strains showed marked tolerance, and there seems to be every hope that it will soon be possible to replace S.G. 29 with one of the U. 4/4/2 derivatives without much loss of lint quality. During the past five seasons, however, cotton strains have been produced in Uganda which are so highly resistant to blackarm that dusting becomes unnecessary.

In a large experiment of complex type, designed as a combined

variety, dusting, and sowing date trial, carried out at Serere, dusting with 413a and abavit B [ibid., xiv, p. 82] significantly increased yield in the plots sown in June; no difference was shown between the dusted and undusted plots sown in April, May, and July. In a miniature varietal test the discarded control variety N. 17 gave a significantly higher yield and fewer blackarm lesions than S.G. 29, used at present; all the selections showed considerably less blackarm than N. 17 or S.G. 29, and the more recent U. 4/4/2 derivatives gave particularly high yields [ibid., xiv, p. 358]. Owing to unfavourable weather and severe blackarm infection the yields obtained at Serere and in the Eastern Province were below the average, but there is every prospect that such resistant strains as S.P. 87 will prove a success in the Eastern Division.

At Ibadan, Nigeria, wet conditions favoured blackarm and the loss of crop was severe. In Tanganyika the angular leaf spot was rather more common than usual, but the disease was not sufficiently prevalent to justify control measures.

TAUBENHAUS (J. J.) & CHRISTENSON (L. D.). **Insects as possible distributors of Phymatotrichum root rot.**—*Mycologia*, xxviii, 1, pp. 7–9, 1936.

When three species of soil-inhabiting insects were caged and fed on cotton roots covered with a copious growth of *Phymatotrichum omnivorum* [*R.A.M.*, xiv, p. 629] the fungus could not be reisolated from the faecal pellets or the insects themselves. Negative results were also obtained by feeding the insects on cotton leaves heavily coated with the spores of the fungus and on a sweetened solution containing a heavy suspension of the spores. It therefore appears to be probable that insects are not associated with the spread of *P. omnivorum*.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Longevity of sclerotia of Phymatotrichum omnivorum in moist soil in the laboratory.**—*Amer. J. Bot.*, xxiii, 1, pp. 10–12, 1 fig., 1936.

The authors state that the results of experiments, in which sclerotia of *Phymatotrichum omnivorum* [see preceding abstract], collected in 1929 from carrots in Texas, were kept for varying periods of time up to five years in the laboratory in stoppered vials with water, dry soil, or clay soil containing varying percentages of moisture, showed that the sclerotia in air-dry soil lost their viability before the first germination test, which was made nine days after the beginning of the experiment. Those in water and in soil with 10, 50, or 60 per cent. moisture were still viable at that date, but none germinated in the second test, one year later. In soils, however, with 20, 30, or 40 per cent. moisture, the sclerotia were still able to germinate at the end of five years and to cause typical root rot of cotton seedlings.

ROGERS (C. H.). **Apparatus and procedure for separating Cotton root rot sclerotia from soil samples.**—*J. agric. Res.*, lii, 1, pp. 73–79, 3 figs., 1936.

After a brief reference to the difficulties presented by the methods hitherto used to separate the sclerotia of *Phymatotrichum omnivorum* [see preceding abstracts] from the soil, an account is given of the con-

struction and working of an apparatus which is claimed to be able to handle from two to four tons of soil per working day. In principle it consists of a vertically mounted, coarse-mesh cylinder screen with a fine-mesh horizontal screen below; the material is first washed through the coarse screen, drops on the fine-mesh screen, and is then passed on to a finer screen partially submerged in water and moving in a reciprocating manner. The sclerotia are separated from the resulting residue left on the screens by stirring in a sugar-solution with a specific gravity of 1·15 to 1·25 which is sufficient to allow the sclerotia to float to the surface. Their viability is not affected by the sugar solution.

PARHAM (B. E. V.). **Mycological notes—mortality in larvae of Teleonemia lantanae.**—*Agric. J. Fiji*, viii, 1, p. 31, 1935. [Received May, 1936.]

Heavy mortality among the final instar larvae and adults of *Teleonemia lantanae* in Fiji (where the insect was introduced in 1928 for the biological control of *Lantana crocea*) has been ascertained to be partly due to infection by a species of *Hirsutella* resembling *H. citriformis*, recorded from Ceylon [cf. *R.A.M.*, iii, p. 335], New Zealand, and elsewhere.

WINGARD (S. A.). **Parasitism of the Apple leaf hopper, Typhlocyba pomaria, by Entomophthora.**—Abs. in *Phytopathology*, xxvi, 2, p. 113, 1936.

The examination of a large number of dead apple leafhoppers (*Typhlocyba pomaria*), which occurred in a destructive form in Virginia orchards in August, 1935, showed that the insects had been parasitized by a fungus apparently identical with *Entomophthora sphaerosperma* [*R.A.M.*, xv, p. 18].

YING (S. H.). **Yeast-like fungi in sputa of tuberculous patients.**—*J. trop. Med.* (*Hyg.*), xxxix, 1, pp. 4–9, 4 figs., 1936.

Nine strains of yeast-like fungi were isolated from 100 cases of pulmonary tuberculosis at the Shanghai National Medical College and one from 20 patients with normal lungs. According to their biochemical properties the strains in the pathological group belong to *Monilia* (*Cryptococcus*) *macroglossiae* [*R.A.M.*, v, p. 365], *M.* [*Candida*] *pinoyi*, *M.* [*C.*] *krusei* [ibid., xv, p. 20], *M. bronchitica*, and *M.* [*C.*] *tropicalis* [ibid., xiv, p. 759], while the normal sputum yielded *M. bronchitica*. The results of animal inoculations established the greater virulence of the organisms from tuberculous patients.

OBRTEL (J.). **Ekzema serpiginosum epidermophyticum (Epidermophyton rubrum Castellani-Bang).**—*Derm. Wschr.*, cii, 6, pp. 168–172, 2 figs., 1936. [German.]

From 7 out of 400 cases of dermatomycosis investigated at Prague the writer isolated a fungus of rare occurrence in Europe—*Epidermophyton* [*Trichophyton*] *rubrum* [*R.A.M.*, xv, p. 219]—which has been reported chiefly from the United States, the East, and Japan. Clinical details of the cases are given.

HASEGAWA (M.) & YAMAMOTO (K.). **Über einen bei Affen gezüchteten Pilz: Microsporon fulvum.** [On a fungus cultured from apes: *Microsporon fulvum*.]—*Jap. J. Derm. Urol.*, xxxix, 2, pp. 23–25, 5 figs., 1936.

A fungus agreeing in symptomatological, cultural, and morphological characters with *Microsporon fulvum*, an agent of kerion celsi on man in Japan [*R.A.M.*, xii, p. 291], was isolated from three apes (*Macacus cynomolgus*) imported from the South Sea Islands. After 13 days on Sabouraud's maltose agar at room temperature, the colonies of the fungus were yellowish-brown with a powdery surface and encircled by a downy, white fringe. The slender hyphae showed piriform swellings and bore laterally long chains of spores; chlamydospores, nodular organs, and a profusion of spindle spores, mostly quinqueseptate, were also produced. Positive results were given by experiments in the transmission of the fungus to man.

CASTELLI (T.). **L'uso della silice gelatinosa per lo studio della sporificazione dei Blastomiceti.** [The use of silica gel for the study of spore formation in the Blastomycetes.]—*Boll. Ist. sieroter. Milano*, October, 1935. [Abs. in *Boll. tec. Tab.*, xxxii, 4, pp. 321–322, 1935.]

A silica gel medium is stated to have proved very superior to malt agar and Gorodkowa's agar for the culture of various strains of Blastomycetes, inducing rapid and abundant spore formation.

SORENSEN (C. M.) & PARFITT (E. H.). **Types of Oospora found in butter.**—Abs. in *J. Bact.*, xxxi, 1, pp. 86–87, 1936.

Eight distinct varieties of *Oospora lactis* were differentiated in the course of an examination of acidulated potato dextrose agar plates of pasteurized commercial sour cream butter [*R.A.M.*, xiv, p. 761] at Purdue University [Indiana]. Further studies revealed significant differences among the varieties as to caseolysis, lipolysis of milk and tributyrin, growth rate, optimum temperature, majority thermal death-point, and caseolytic and lipolytic enzyme production.

VANTERPOOL (T. C.). **Seedling damage of Flax caused by Rhizoctonia solani and Pythium debaryanum.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 300–302, 3 figs., 1935.

This is a very brief account of laboratory and field studies the results of which have shown that the severe early damping-off of flax which has occurred since 1930 in many parts of Saskatchewan is due almost exclusively to *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, iv, p. 443; xiv, p. 362], while in moister localities a contributory part in the etiology of the trouble may also be played by *Pythium de Baryanum* [ibid., x, p. 732]. Traces were also found of early seedling injury being caused by *Fusarium* spp., but typical wilt due to these organisms only attained some importance later in the season. The results also indicated that a measure of control of damping-off may be obtained by rotating dicotyledonous with monocotyledonous crops.

Flor (H. H.). **Browning disease of Flax in the United States.**—Abs. in *Phytopathology*, xxvi, 2, pp. 93–94, 1936.

During the last three years the browning disease of flax (*Polyspora lini*) [*R.A.M.*, xv, p. 369], which before 1932 was known to occur in the United States only in Michigan, has been detected in Iowa, Minnesota, North Dakota, and Oregon. A survey of the flax fields of Southern Minnesota and Northern Iowa in 1935 revealed the stem-canker phase of the disease in a severe form in 23 per cent. of those inspected, the incidence of infected plants ranging from a trace to 15 per cent. In the eastern half of North Dakota browning was also found to be widespread but apparently causing little damage. Among the commercial seed-flax varieties, Bison has shown the greatest susceptibility to *P. lini*, followed in decreasing order by Red Wing, Linota, Buda, and Rio; the yield of the first-named in inoculated plots was reduced to 61 per cent. of the normal and the average weight per seed to 85 per cent. of that from the controls.

Garassini (L. A.). **El 'pasmo' del Lino Phlyctaena? linicola Speg. Ensayo a campo de resistencia varietal y estudio morfológico y fisiológico del parásito.** ['Pasmo' of Flax. ? *Phlyctaena linicola* Speg. Field experiment on varietal resistance and a morphological and physiological study of the parasite.]—*Rev. Fac. Agron. La Plata*, xx, 2, pp. 170–261, 19 figs., 19 graphs, 1 map, 1 plan, 1935. [Received March, 1936.]

An exhaustive, fully tabulated account is given of recent field and laboratory studies in the Argentine on the varietal reaction of flax to the 'pasmo' [spasm] disease (*Phlyctaena linicola*) [*R.A.M.*, xi, p. 300; xv, p. 399] (for which the name of *Septoria linicola* (Speg.) nov. comb. was substituted in a paper read by the writer at a meeting on 27th September, 1935, of the Agricultural Study Centre, National University of La Plata).

The results of artificial inoculation experiments on 1,000 plants of each of 30 varieties of different origin substantiated Rodenhiser's conclusions [ibid., x, p. 315] as to the high degree of susceptibility of the Argentine as compared with the North American types; among the latter Bolley 134 and 187 and Buda N.D.R. 119 Boll. were relatively resistant, the first-named also behaving similarly in laboratory tests.

In seven different culture media the colonies of the fungus showed morphological variations, potato glucose agar giving the most satisfactory growth and sporulation. With the exception of sweet potato agar, all the media used reduced the length of the spores compared with that obtained on the natural substratum (26·45 by 3·24 μ), the effect of oatmeal agar being particularly marked in this respect (20·60 by 2·88 μ); the corresponding length figures for potato glucose, sweet potato, carrot, maize, and Czapek's agars were 21·50, 25·45, 23·15, 24·20, and 21·45 μ, respectively. The optimum temperature for the development of the fungus was found to be 24° C. The data given by Spegazzini and Brentzel for the pycnidial dimensions [ibid., v, p. 366] were confirmed in these investigations.

A bibliography of 83 titles is appended.

GREEN (D. E.). **Snowdrop mould.**—*Gdnrs' Chron.*, xcix, 2563, pp. 93–94, 4 figs., 1936.

A very brief popular account is given of the snowdrop (*Galanthus nivalis*) disease, commonly known in England as mildew or white mould, which is caused by *Botrytis galanthina* [*R.A.M.*, viii, p. 41; xi, p. 460]. Though comparatively rare, the disease is stated to be more commonly found in the northern than in the southern counties, and to be encouraged by humid conditions and waterlogged soil. Control measures recommended are the removal and destruction of infected bulbs, the use of healthy stock, and the disinfection with formalin of beds before planting.

GREEN (D. E.). **Antirrhinum rust: II. The results of spraying and dusting with fungicides.**—*J.R. hort. Soc.*, lxi, 2, pp. 64–76, 2 figs., 1 map, 1936.

A tabulated account is given of the writer's experiments at the Royal Horticultural Society's Garden, Wisley, Surrey, in 1935 in the control of *Antirrhinum* rust (*Puccinia antirrhini*) [*R.A.M.*, xiii, p. 445; xv, p. 371]. The trials comprised 104 plots of 40 Malmaison plants each planted out on 28th May; spraying commenced on 1st July and further treatments were applied at fortnightly intervals. In spite of artificial inoculation the disease did not spread to any appreciable extent until about 9th September, the pustules in the early stages of infection being continuously eaten away by the larvae of *Mycodiplosis* spp. [ibid., v, p. 314].

A careful analysis of the condition of the plants in the treated plots indicated that the best results were given by Burgundy mixture 4–5–50 and Bordeaux mixture 4–6–50 (both used with saponin added at the rate of 2 oz. to 100 galls.), the former being slightly superior, especially where fewer applications were made; neither of these preparations, however, was fully satisfactory, the average marks for healthiness awarded to the plots thus treated being only 112 and 153, respectively, out of a possible 320. None of the other treatments proved even moderately effective. It may be considered doubtful whether *P. antirrhini* can be completely controlled by fungicidal treatments under ordinary outdoor conditions in Great Britain, and experiments are in progress to develop rust-resistant selections. So far some 77 per cent. of a resistant stock of 550 plants have remained free from the disease notwithstanding exposure to natural and artificial infection.

FERRARIS (T.). **Quadretti fitopatologici.** [Phytopathological notes.]—*Riv. agric., Roma*, xxxii, 724, pp. 26–27, 1936.

In September, 1935, *Pelargonium zonale* plants growing in various localities in Piedmont, developed dry yellowish to reddish-brown spots on the leaves, which gradually dried up and fell off, infection being found to be due to *Macrosporium macalpineanum*, a species allied to *M. pelargonii* [*R.A.M.*, xiv, p. 681]. Three applications of 1 per cent. Caffaro powder were effectual against the disease in the greenhouse, but on plants left in the open and exposed to the rain the disease continued to spread. During the rainy weather the plants became severely infected

with *Botrytis vulgaris* [*B. cinerea*], the spread of which was checked by repeated applications of quicklime and sulphur mixed in equal proportions. Cinerarias [*Senecio cruentus*] in Italy are liable to become infected by *Bremia lactucae* [ibid., xiv, p. 683], the upper surfaces of the leaves developing yellowish, later reddish, irregular spots causing withering and defoliation. Infection passes rapidly from leaf to leaf and the plant soon wilts and dies. The disease may be avoided by keeping the plants in warm but not over-damp conditions, airing them frequently, and spraying lightly from time to time with a cupric mixture at a concentration of 0·3 to 0·5 per mille. If the lower leaves (the first to be attacked) are already affected they must be removed and the plants treated with 0·5 per cent. Bordeaux mixture or Caffaro powder.

Laubert (R.). **Eine neue Begonienkrankheit.** [A new Begonia disease.] —*Kranke Pflanze*, xiii, 2, p. 31, 1936.

In December, 1935, the writer observed on hybrid begonia leaves of the Konkurrent and Konkurrent compacta varieties in a west German nursery a mildew (*Oidium*) [*O. begoniae*] causing small, discoloured, pale to light brownish spots, occasionally spreading over the whole surface in the form of a chalk-white efflorescence. Barrel-shaped conidia, 25 to 34 by 12 to 15 μ, were produced in immense numbers but no perithecia. There appears to be no previous record of a species of *Oidium* on this host [but see *R.A.M.*, xiv, p. 447] and it is thought probable that in the present instance the fungus spread to the begonias from some neighbouring plant. In this connexion attention is drawn to the widespread increase of destructive plant mildews in Germany and Europe generally of recent decades [cf. ibid., xii, p. 578].

Wasewitz (H.). **Schäden durch die Blattfleckenkrankheit der Cinerarien.** [Damage from the leaf spot disease of Cinerarias.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 9, pp. 99–100, 1936.

Cinerarias [*Senecio cruentus*] in the Frankfurt-am-Main district of Germany are stated to have suffered severely of recent years from the attacks of *Ascochyta cinerariae*, the agent of a circular, brown to black spotting of the foliage, which ultimately shrivels or rots, rendering the plants unmarketable. The oval spores of the fungus drop from the lesions to the ground and perpetuate the disease through the soil. For control of the disease sanitary measures should be supplemented if necessary by soil disinfection with formalin.

Dodge (B. O.). **Notes on some bacterial and fungous diseases in our gardens.**—*J.N.Y. bot. Gdn*, xxxvii, 434, pp. 29–33, 2 figs., 1936.

In connexion with a few popular observations on the occurrence and control of some well-known bacterial and fungous diseases of ornamentals [reference to which has frequently been made in this *Review*], the writer mentions the fact that fireblight of pears (*Bacillus amylovorus*) [*R.A.M.*, xiv, p. 702] is becoming established in the United States on a number of ornamentals of the apple group, such as hawthorns [*Crataegus* spp.], flowering crabs, shadbush [*Amelanchier canadensis*], quince, and mountain ash [*Pyrus aucuparia*].

Smith (K. M.). **The virus diseases of glasshouse and garden plants.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iv, pp. 126–140, 8 figs., 1936.

After pointing out that in recent years virus diseases of ornamental flowering plants have increased both in number and in economic importance, the author briefly reviews the chief characteristics of this type of infection, and gives short notes on the symptoms set up by the tomato spotted wilt virus [*R.A.M.*, xiv, pp. 404, 763; xv, p. 324] on *Callistephus chinensis*, *Calendula*, chrysanthemum, cineraria [*Senecio cruentus*], dahlia [ibid., xv, p. 280], zinnia, lettuce, *Solanum capsicastrum*, *Streptosolen jamesonii*, eggplant, chilli pepper (*Capsicum annuum*), Cape gooseberry (*Physalis*) [*peruviana*], *Petunia*, *Salpiglossis* spp., tobacco, garden nasturtium (*Tropaeolum* spp.), *Papaver nudicaule*, begonia, *Primula*, *Campanula pyramidalis*, *Trachelium* sp., calceolaria, *Gloxinia*, lupin, delphinium, *Zantedeschia aethiopica* [ibid., xiv, p. 725], and *Hippeastrum* sp.; by cucumber virus 1 [ibid., xiv, p. 811] on *Callistephus chinensis*, *Calendula*, delphinium, lupin, pansy [*Viola tricolor*], *Primula obconica*, and *P. sinensis*, polyanthus [*P. elatior*], and *Lobelia cardinalis*; together with notes on cabbage mosaic [ibid., xv, p. 97], mosaic or stripe of narcissi and other bulbous plants [ibid., xi, p. 785], tulip breaking [ibid., xv, p. 156], lily mosaic [ibid., xiv, p. 764] and rosette or yellow flat [ibid., xiv, p. 165], and pelargonium leaf curl [ibid., xii, p. 223]. The paper concludes with practical recommendations for control.

Husz (B.). **Néhány hervadásos növénybetegség hazánkból.** [Some wilt diseases of cultivated plants.]—*Bot. Közl.*, xxxii, 1–6, pp. 38–51, 4 figs., 1935. [German summary.]

Hot, dry summers, such as that of 1932 in Hungary, with high soil temperatures, are stated to favour the development of *Fusarium* diseases of plants, both in the form of tracheomycoses and in that of root rots. The Autumn Rose potato appears to be particularly liable to infection by *Fusarium oxysporum*, which did not occur on Prof. Wohltmann. A *Fusarium* tracheomycosis was further observed in lupins [cf. *R.A.M.*, xiv, p. 109], *Capsicum annuum* [cf. ibid., xiv, pp. 7, 720], and carrots [cf. ibid., xii, p. 4]. *Phlox decussata* was found to be attacked by various species of *Fusarium*, some belonging to the section *Martiella* and others undetermined, which caused a rotting of the cortical parenchyma extending upwards from the roots and involving yellowing and desiccation of the plants. Other hosts of this group of organisms included *Dahlia variabilis*, tomatoes, *Callistephus chinensis*, peach, and *Pelargonium*, and *Pinus* [*laricio* var.] *austriaca* seedlings.

A species of *Verticillium* isolated from *Phlox decussata* on sandy soil was identified, on the basis of its morphological characters (mycelium 1·5 to 2 or 3·5 to 4 μ in diameter, conidia 4 to 7 by 1·5 to 3·5 μ, microsclerotia under 90 μ), as *V. albo-atrum* sensu Wollenweber [ibid., iv, p. 495; cf. also xii, p. 338]. There is stated to be only one previous definite record of this fungus in Hungary, where it was observed by G. Moesz on potatoes (*Term Tud. Közl.*, p. 15, 1928). In the writer's opinion the economic importance of *V. albo-atrum* in Hungary is likely to be negligible, since the high soil temperatures prevailing from July to September are as detrimental to it as they are conducive to the

spread of *Fusarium*. The vascular bundles of diseased potatoes yielded *Colletotrichum atramentarium* [ibid., xiv, p. 466; xv, p. 370] in addition to *F. oxysporum* [ibid., xiii, p. 651], the taxonomy of which is discussed on the basis of Wollenweber's Monograph [ibid., xv, p. 321].

Padwick (G. W.) & Henry (A. W.). **Studies on the temperature and host relations of Ustilago bromivora (Tul.) Fisch. V. Waldh. causing smut of Agropyron species.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 248–253, 1 fig., 1 graph, 1935.

In the tests briefly described and tabulated in this paper, heavy infection of western rye grass (*Agropyron tenerum*) with smut (*Ustilago bromivora*) [*R.A.M.*, v, p. 741; xiv, pp. 493, 572] resulted when the seeds from which the plants were raised were dusted with smut spores from this host and then germinated at different temperatures ranging from 3° to 28° C. In distilled water the spores of *U. bromivora* germinated at temperatures from 8° to 29·5°, with an apparent optimum between 10° and 15°. These results indicate that the smut under Canadian conditions cannot be controlled by regulating the date of sowing the grass. The results of host range tests showed that *A. griffithsii*, *A. dasystachyum*, and *A. richardsonii* are also susceptible to the smut strain from *A. tenerum* used, although they were less heavily attacked than the last named. Seven other species, including *A. cristatum*, did not contract infection.

'Brown patch' fungus disease (Rhizoctonia sp.) infesting cultivated turf grasses of Queensland.—*Bull. Qd Bd Greenkeep. Res.* 2, pp. 8–16, 1936. [Mimeographed.]

Since 1933, the year of its first record from Queensland, the 'brown patch' disease of lawn turf [*R.A.M.*, xiv, p. 449] has become one of the most serious problems of practically every golf course and bowling green within the Greater Brisbane area, and in numerous country centres of that State. The only organism definitely associated with the disease was an unidentified species of *Rhizoctonia*, and inoculations with this fungus on pots of healthy turf of *Digitaria didactyla* [*Panicum didactylum*] reproduced the typical symptoms. Besides *P. didactylum* species of *Agrostis* were extremely susceptible, while *Cynodon dactylon* showed apparently much greater resistance. In experiments on control made in 1935 the applications of mercuric chloride and especially calomel [mercurous chloride: ibid., xiv, p. 562] gave good results.

Sanford (G. B.) & Cormack (M. W.). **On varietal resistance of Medicago and Melilotus to root rots caused by Sclerotinia sp. and Plenodomus meliloti D. & S.**—*Proc. World's Grain Exhib. Conf., Regina*, ii, pp. 290–293, 1 fig., 1935.

The results of field experiments in Alberta from 1931 to 1933 indicated that lucerne is much more resistant than sweet clover (*Melilotus* spp.) [*M. alba* and *M. officinalis*] to the *Sclerotinia* sp. [*R.A.M.*, xiv, p. 175] used in the work, and that this fungus was still alive in the soil and capable of attacking the hosts a year after having been added to the soil, while inoculum of *Plenodomus meliloti* [loc. cit.] lost its infectivity within the same period. There also was clear evidence that certain

varieties of lucerne and more especially of sweet clover are more resistant than others to the *S.* sp., and that varieties of the *M. officinalis* group were less susceptible than those of the *M. alba* group. No conclusive results could be obtained in regard to resistance of both hosts to *P. meliloti* in the absence of a satisfactory method of soil infection with this organism. There was some evidence that winter hardiness in both lucerne and sweet clover is closely related to their natural resistance to disease, at least in so far as the winter dormancy period is concerned.

JAMALAINEN (E. A.). **Omenan kuoppataudista ja sen esüntymisestä Suomessa.** [Cork disease of Apples and its appearance in Finland.] —*Maataloust. Aikakausk.*, viii, 1, pp. 24–35, 4 figs., 1936. [English summary.]

A description is given of cork disease of apples [cf. *R.A.M.*, xiv, p. 770, and next abstract] (known in Finland as the 'cavity disease'), a marked feature of which is the presence of cavities on the surface of the green fruit. When the fruit is cut open the flesh shows round, brown spots, mostly 4 to 8 mm. in diameter, which may also be observed in groups in the vascular bundles. The differences between cork disease and bitter pit [ibid., xv, p. 344] (which has been reported as occurring in Finland since 1910) are indicated. From 43 reports received at the Tikkurila Agricultural Experiment Station from 1933 to 1935 it appears that cork disease is prevalent in a more or less severe form in all the apple-growing districts of the country as far north as lat. 63°. Among the varieties attacked are Charlomovsky, Canella, Säfstaholm, Antonovka, White Nalif, Åkerö, Alexander, Charlottenthal, and Sugarmiron.

ASKEW (H. O.), CHITTENDEN (E.), & STANTON (D. J.). **'Internal cork' of Apples, Nelson, New Zealand.**—*N.Z. J. Sci. Tech.*, xvii, 4, pp. 595–599, 1936.

Determinations of soil moisture and physical properties conducted on two orchard areas in the Nelson district of New Zealand showed no direct connexion between 'internal cork' of apples [cf. preceding abstract] and a particularly low moisture content. Similarly, no positive correlation could be traced between the disease in Jonathan and Dunn's Favourite and a low moisture content of the fruit. While these data contradict the theory of water deficiency as the primary cause of corkiness, they do not preclude the probability (which is, in fact, supported by protracted observations at the Cawthron Institute) that the trouble may be accentuated by dryness of the soil.

GOIDÀNICH (G.). **Malattia del pero prodotta da un basidiomicete.** [A Pear disease caused by a Basidiomycete.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 4, pp. 501–532, 13 figs., 1935. [Received April, 1936.]

An account is given of the author's study of a dying-off of pear trees in different parts of Italy, caused by a fungus of which some of the characters resembled those of *Stereum purpureum* [*R.A.M.*, xiv, p. 772], but whose systematic position could not be definitely determined in the absence of fructifications. No silvering of the foliage or

other external symptoms were apparent, but internally the wood was discoloured. In the thicker branches and trunk the central zone of chestnut colour was surrounded by a darker area in contact with the healthy part of the wood. At the base of the trunk the affected tissues were almost black. Mycelium was abundantly present in the diseased tissues and was characterized by the frequent occurrence of clamp-connexions. The fungus attacks only weakened or dead cells, liberating a substance (probably an enzyme) which causes through the oxidation of the tannin the precipitation of the cytoplasm. Infection takes place at points where the host tissues are dead or weakened, especially near the graft union.

Willison (R. S.). **Peach canker investigations. II. Infection studies.**—*Canad. J. Res.*, xiv, 1, pp. 27–44, 3 pl., 3 graphs, 1936.

In further investigations into peach canker in Ontario, a comparative study of *Valsa leucostoma* and *V. cincta* [*R.A.M.*, xv, p. 162], isolated more or less consistently from cankers of various ages and die-back twigs showed that in culture on potato dextrose agar and Leonian's malt agar the former was hair-brown, with rostrate, usually dark pycnidia 1 mm. or less in diameter, which exuded cirri when mature, while the latter was whitish to olive-buff, sometimes black in the substratum, with white, felty pycnidia 1 to 3 mm. in diameter rarely if ever exuding cirri, though usually full of viable spores. On the host the stroma of *V. leucostoma* was compact, contained no host cells, and was delimited beneath by a black zone of carbonized fungal and host cells; the ascospores measured 10 to 17 by 2 to 4·5 μ. The stroma of *V. cincta* on the host was loose, contained host cells, and was delimited from the host cortex by a thin, black, sometimes only marginal line; the ascospores measured 14 to 28 by 4 to 7 μ. In both species the pycnospores ranged from 5 to 10 by 1 to 2 μ.

Artificial infection experiments, a preliminary account of which has already been noticed [loc. cit.], showed that *V. cincta* was a virulent wound parasite able to infect freshly made wounds during the late autumn, winter, and spring, and to give rise to perennial cankers. *V. leucostoma* [ibid., xv, p. 283], was found to be practically innocuous.

Défago (G.). **Sur quelques Valsées von Höhnel parasites des arbres à noyau dépérissants.** [On certain Valseae von Höhnel parasitic on dying-off stone fruit trees.]—*Thesis*, École Polytechnique Fédérale Zurich, viii+111 pp., 4 pl., 10 figs., 4 graphs, 1935.

This is a comprehensive and fully tabulated report of the author's investigations in Switzerland and south France to determine the part played by the Valsaceae in the causation of the very serious dying-off of stone fruit trees, especially the apricot. He considers that the constant presence of an entostroma and of a conceptacle separating the fructification from the underlying host tissue of substratum in *Valsa leucostoma* (which, in the regions studied, is chiefly prevalent on cherries and peaches), *V. cincta* [see preceding abstract] (chiefly on apricots, peaches, and plums), and *V. nivea* (which in nature was only seen on *Populus nigra* but was experimentally shown to be able to attack wounded apricot wood) is sufficiently significant to warrant the separation

of these species into the genus *Leucostoma*; he therefore accepts the names *L. persoonii* (Nit.) Togashi [*R.A.M.*, xi, p. 60, also cf. xv, p. 162] and *L. cincta* (Fr.) v. Höhn. for the first two, respectively, and suggests *L. nivea* for the third. Only two other members of the family were found on *Prunus* spp. in France and Switzerland, namely, *V. ambiens* and *V. microstoma*, the latter of which has also been recorded from Italy.

Morphological and biological studies [considerable details of which are given] showed that the above-named three *Leucostoma* species are distinct and well-defined morphological entities; the mature pycnidia are rather easy to confuse with each other but in earlier stages of growth those of *L. persoonii* are black, with dark red cirri; those of *L. cincta* are brown with amber-pink cirri, and those of *L. nivea* are much more rounded and smaller than the pycnidia of the other two. *V. ambiens* had pycnidia with an emergent, black ostiole, and yellowish-white cirri. The three *L.* spp. also differ significantly from each other in the measurements of their perithecia, asci, and ascospores, as well as in the nature and colour of their growth on artificial media. *L. persoonii* was shown to consist of nine biologic forms, differing in morphological details and in their pathogenicity; the forms are not, however, specific to certain species of *Prunus*. The extremes of these nine forms agree closely with certain strains of *L. nivea*, indicating the possibility that future work may show that *L. persoonii* and *L. nivea* are in reality the same species.

Artificial inoculation through injured bark of 39 species of *Prunus* with the *persicae* form of *L. persoonii* and two forms (Charrat I and Chippis) of *L. cincta*, showed that all, except *P. graeca* and *P. sieboldii* were susceptible to a greater or lesser degree. The fungi were capable of entrance only through wounded surfaces. The damage done by the organisms to stone fruit trees depends to a large extent on the virulence of the individual strains of the fungi and also on the health and vigour of the host, as determined by soil and weather conditions, the latter being the chief predisposing factors. The control measures very briefly indicated comprise the careful handling of the trees to avoid unnecessary wounding, the dressing of all pruning wounds with antiseptics, and a thorough sanitation of the fruit groves.

Blodgett (E. C.). **The anthracnose of Currant and Gooseberry caused by Pseudopeziza ribis.**—*Phytopathology*, xxvi, 2, pp. 115–152, 3 pl., 6 graphs, 1936.

This is an expanded account of the writer's studies on the physiology and pathogenicity of a number of strains of *Pseudopeziza ribis*, the agent of currant and gooseberry anthracnose, from Wisconsin, Oregon, Canada, and Holland, a preliminary note on which has already appeared [*R.A.M.*, xiv, p. 377].

The appressoria of the fungus were frequently found to play a part in the direct penetration of the cuticle and epidermal cell walls of the leaves. All the foliar tissues were disorganized and killed by the inter- and intracellular development of the organism. It was ascertained that primary spring infections are initiated by ascospores, by conidia produced in the spring, and probably also by overwintered conidia. Plants

inoculated on the lower leaf surface were more heavily infected than those inoculated on the upper, and plants held at higher temperatures prior to inoculation than those held at lower. Infection by conidia occurred at favourable temperatures (10° to 28° C.) with a moist incubation period of 12 hours or more.

Under the environmental conditions prevailing at Sturgeon Bay, Wisconsin, anthracnose is preventable by four applications of 3–4–50 Bordeaux mixture (*a*) just before the plants bloom, (*b*) immediately after fruit set, (*c*) three weeks later, and (*d*) just after harvest, while joint control of this disease and powdery mildew of gooseberries (*Sphaerotheca mors-uvae*) was secured by the substitution of lime-sulphur (1 in 40) for Bordeaux in the first two treatments.

Wolf (F. A.). **A correction.**—*Mycologia*, xxviii, 1, p. 85, 1936.

As the publication of the name *Sphaerella* (*Mycosphaerella*) *dubia* L. E. Miles (*Trans. Ill. Acad. Sci.*, x, p. 250, 1917) antedates the publication of *Mycosphaerella dubia* Wolf [*R.A.M.*, xiv, p. 775], it becomes necessary to assign another name to the perfect stage of *Cercospora rubi*, and the name *M. confusa* is proposed.

Hildebrand (A. A.) & Koch (L. W.). **A microscopical study of infection of the roots of Strawberry and Tobacco seedlings by micro-organisms of the soil.**—*Canad. J. Res.*, xiv, 1, pp. 11–26, 3 pl., 2 graphs, 1936.

In this study strawberry and tobacco seedlings growing either in seed-bed muck soil heavily infested with *Thielaviopsis basicola* [*R.A.M.*, xv, p. 263] and other organisms pathogenic to tobacco, in soil from a commercial strawberry plantation where severe, typical strawberry root rot had occurred, or in a greenhouse compost soil, were examined microscopically daily, commencing a few hours after germination and continuing throughout a period of four weeks.

Organisms observed within the root tissues of both hosts included the Phycomycetous mycorrhizal fungus [ibid., xv, p. 178], *T. basicola* (noted in plants grown in muck soil only), *Rhizoctonia* [*Corticium*] *solani* and the orchid *Rhizoctonia* [*R. repens*: loc. cit.], several forms of *Pythium*, *Asterocystis* [ibid., xiii, p. 785], certain unidentified fungi, a minute alga, and nematodes. Organisms observed on the root surfaces included representatives of the genera *Ramularia*, *Fusarium*, *Helminthosporium*, *Sphaeropsis*, and *Cephalothecium*. The sequence of appearance, percentage occurrence, and parasitic capabilities of certain of the organisms varied in roots grown in different soils.

Initial infection by the Phycomycetous mycorrhizal fungus was noted in the tobacco and strawberry seedlings grown in muck soil 6 and 5 days, respectively, after germination; in the root rot soil after 13 and 5 days, respectively, while in compost infection of strawberry seedlings occurred 7 days after germination. In strawberry but not in tobacco seedlings the tissues resisted infection by the endophyte in the regions of the root tip and the root-stem transition, while in the intermediate region heavy infection by the endophyte usually occurred in both hosts. Besides minor differences the strawberry endophyte showed a sparsely septate mycelium with short papilla-like protuberances, vesicles more or less oval, and only rarely caused necrosis, whereas the mycelium of

the tobacco fungus was frequently septate, without protuberances, the vesicles were spheroidal, intracellular vesicles were more numerous, and considerable necrosis was present. These observations are considered to show that the so-called Phycomycetous mycorrhizal fungus consists of morphologically distinct strains.

Individual cortical cells of both hosts at or near ground-level frequently contained the coiled filaments of a blue-green alga. Necrosis was not correlated with the presence of this organism alone, but for the present it must be regarded as a possible factor in the root-rot complex.

From these results and from observations made on other hosts, the authors conclude that a root rot as it occurs in nature is extremely complex, even where a primary causal agent is recognized, and that fungi belonging to a comparatively few groups or genera are 'common factors' in root-rot complexes of different hosts.

Alcock (Mrs. N. L.) & Howells (D. V.). **The Phytophthora disease of Strawberry.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iv, pp. 52–58, 1936.

In the first part of this paper, by Mrs. Alcock, a general review is given of the results of the investigation of the strawberry red core disease (*Phytophthora* sp.) [allied to *P. cinnamomi*: *R.A.M.*, xiii, p. 784]. Though resisting all attempts to induce germination the evidence available suggests that the oospores give rise to mycelium which invades the roots, the tips becoming packed with hyphae growing towards the root base. Infected roots die off quickly and fresh rings of roots are produced above the diseased ones, only to be infected in turn. Oospores are formed in great numbers, and the fungus has been found to remain alive in infected soil for at least eight years. Seven years' experiments in treating badly infected soil gave no really satisfactory result, but certain strains of one variety were found to show resistance and are being grown for further study.

In the second part, Howells states that while spread is generally from infected plants there is evidence that it may arise from boots, implements, and birds. The direction it takes is primarily governed by the most intimate direction of plant contact, spread along rows and beds being very striking.

Magee (C. J.). **Cercospora leaf spot of Bananas.**—*Agric. Gaz. N.S.W.*, xlvii, 1, pp. 30–32, 2 figs., 1936.

During the past two or three years banana leaf spot (*Cercospora musae*) [*R.A.M.*, xv, p. 164], hitherto a widespread but unimportant disease locally, has occurred in a severe form in several districts of New South Wales as a result of unsatisfactory land being brought into cultivation. The disease is prominent in the cool, wet season (April to September) but generally causes minor losses, only the older leaves of the more mature plants usually being affected. Where severe infection has occurred considerable defoliation of hundreds of stools has taken place in individual plantations, the bunches left on defoliated stems failing to mature. The checking of the disease in summer is due to the higher temperatures and lower humidities then prevalent and the greater vigour of the plants. Infection is most destructive in plantations

with southerly or south-westerly aspects or altitudes of 1,000 ft. or over, or in those on infertile or over-cropped soils.

Fungicidal treatment both in New South Wales and Queensland having failed to show promising results [ibid., xii, p. 456; xiii, p. 112] the proper choice of the plantation site is of paramount importance if losses are to be avoided. After the spring flush of growth has commenced all dead and damaged leaves should be removed and burned and the vigour of the plants should be maintained by green manuring, fertilizer applications, and weed control.

Jacques-Félix (H.). **La maladie du 'bout noir' des Bananes de Guinée française.** [The 'black tip' disease of Bananas in French Guinea.] —*Rev. Bot. appl.*, xvi, 173, pp. 55–56, 1936.

Helminthosporium torulosum [*R.A.M.*, xv, p. 284] has been observed in French Guinea causing the typical symptoms of 'black tip' in bananas, which are invaded by way of the floral organs or through apical wounds inflicted by their careless or untimely removal. Under local conditions the fungus is sometimes found infecting the stalk through injuries due to excessive sunlight.

Mallamaire (A.). **Les parasites et les maladies du Bananier en Guinée française.** [The parasites and diseases of the Banana in French Guinea.]—*Rev. Bot. appl.*, xvi, 173, pp. 49–54, 1936.

Bananas in French Guinea are stated not to suffer unduly from pests and diseases in comparison with other tropical countries, even the serious rot caused by *Marasmius stenophyllus* [*R.A.M.*, xiv, p. 154; cf. also ibid., xv, p. 165] being controllable by plant sanitation and the application to the infected stems of a copper-lime mixture (3 : 1·5 per cent.). Rotting of the tips of the fruits is associated with a *Fusarium*, which is probably secondary to *Helminthosporium torulosum* [see preceding abstract]. A black, soft rot, starting from the cut end of the stalk and extending to the peduncles and even to the fruits, is caused by wound parasites, e.g., *Gloeosporium musarum* [loc. cit.], *Lasiodiplodia* [*Botryodiplodia*] *theobromae* [ibid., xiii, p. 174], *Verticillium* and *Fusarium* spp., and *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., xv, p. 104]. Recommendations similar to those already made for the control of these rots [ibid., xi, p. 189] are given.

Carter (W.). **The symbionts of Pseudococcus brevipes in relation to a phytotoxic secretion of the insect.**—*Phytopathology*, xxvi, 2, pp. 176–183, 1 fig., 1 diag., 1936.

When colonies of the mealy bug (*Pseudococcus brevipes*) responsible for the green spotting of pineapple leaves in Hawaii [*R.A.M.*, xiv, p. 580] were transferred from pineapple to *Panicum barbinode* their capacity for green spotting was lost and could not be restored by recultivation on the original host. At the same time the rod-like symbiont normally occupying the mycetome of the insect disappeared and was replaced by an extremely minute coccus form visible only under high magnification. The inference from these observations is that the symbiont is pleomorphic and undergoes degeneration as a sequel to a radical change of nutrition.

French (O. C.). **Rate of wear of spray-gun disks.**—*Agric. Engng, St Joseph, Mich.*, xvii, 2, pp. 67, 88, 1 graph, 1936.

Technical details are given of tests on the resistance of six different kinds of spray-gun disks supplied by the J. Bean Mfg Co. to fit the Bean Fig. 789 gun [*R.A.M.*, xi, p. 196] to abrasion, determined by forcing Bordeaux (5-5-50) mixture through them at a pressure of 450 lb. per sq. in. for a maximum period of 39½ hours. It was found that the rust-proof stellite disk offered considerably greater resistance to wear than the other types (phosphorus bronze, brass, and three kinds of steel) tested, and if clean water were procurable would almost retain its original capacity for many hours of use, sandy water being injurious, however, even to a metal of this hardness. In order to exclude sand from the water it is suggested that the elevated water storage tanks used to fill the spray tanks should also serve as sediment-collectors, the water being drawn out about 12 in. from the bottom, where most of the sand or fine grit will be found to have settled.

Beran (F.). **Pflanzenschutzmittel, I. Nachtrag.** [Plant protectives, Appendix I.]—*Neuheiten PflSch.*, xxix, 1, pp. 10–12, 1936.

This appendix to the list of plant protectives officially recommended by the Austrian Institute for Plant Protection [*R.A.M.*, xiv, p. 518] includes eight fungicides, the purposes and modes of application of which are indicated.

Riemann (F.). **Vom Kampf gegen den Vermehrungspilz.** [On the campaign against the propagation fungus.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 6, p. 62, 1936.

Some cultural measures are recommended against the 'propagation fungus' (*Moniliopsis aderholdi*) in German greenhouses and seed-beds [*R.A.M.*, xii, pp. 97, 448], including the use of burnt sandy soil with a small admixture of carbonate of lime, the substitution of cement-concrete for wooden frames, and careful adjustment of the temperature and humidity relations.

Willaume (F.). **Action stimulante de certains traitements insecticides et fongicides sur les plantes cultivées.** [The stimulating action of certain insecticidal and fungicidal treatments on cultivated plants.] —*Rev. Path. vég.*, xxiii, 1, pp. 28–32, 1936.

The author's field and laboratory studies are stated to have shown that stimulation of fruit trees by carbolineum, Bordeaux mixture, and lime-sulphur sprays or by iron sulphate [*R.A.M.*, xv, p. 159] applied as a spray or injected into the trunk against chloroses is qualitatively similar and due to the same initial cause, i.e., the photo-sensitization or photo-catalysis set up. The treatments given contain or produce in the plant more or less fluorescent photo-sensitizing bodies which when acted upon by certain luminous rays emit a different luminous radiation, and can transform the usually inactive radiations of the visible spectrum into active ones. The effect produced, if excessive, causes scorching, sometimes attributed to the effect of the sun [cf. ibid., xv, p. 36].

Lockwood (L. B.). **Fungi from laboratory reagents.**—*Mycologia*, xxviii, 1, pp. 10–12, 1936.

Among the examples of fungal tolerance towards standard chemical reagents observed by the author in his laboratory the following may be mentioned. *Fusarium orthoceras* was isolated from a 0·5 per cent. solution of potassium acetate. A vigorous strain of *Aspergillus fumigatus* was isolated from a 30 per cent. potassium nitrate solution. *A. tamarii* was isolated from a saturated aqueous solution of dimethyldihydro-resorcinol.

Dufrénoy (J.). **Cellular immunity.**—*Amer. J. Bot.*, xxiii, 1, pp. 70–79, 6 figs., 1936.

In this paper the author describes and illustrates with examples the cytological changes that take place under the influence of an invading parasite or virus agent within the living cells of plants susceptible, moderately susceptible, or highly resistant to the respective pathogens. The results of the study indicate that in cases of extreme susceptibility and of most systemic diseases, the host-parasite adjustment is so delicate that the penetration of the pathogen, at least in the initial stages of infection, hardly interferes with the metabolism of the cell, while in a moderately susceptible host the process results in a mobilization of the cell reserves, and the cell itself reverts to the meristematic condition, resuming growth and sometimes eventually dividing. In highly resistant hosts, on the other hand, the cells are killed at the first attempt by the pathogen to enter them, and the vacuolar sap of the surrounding cells becomes very rich in phenolic compounds, which renders them a most uncongenial medium for the pathogen.

Renn (C. E.). **The wasting disease of Zostera marina. I. A phytological investigation of the diseased plant.**—*Biol. Bull. Wood's Hole*, lxx, 1, pp. 148–158, 6 figs., 1936.

The foliage of *Zostera marina* beds affected by the wasting disease [*R.A.M.*, xv, p. 39] in American and Canadian waters was observed by the writer during three years' investigations to consist of young, rapidly growing, green leaves, 8 to 12 cm. in length, from which the characteristic dark blotching and streaking may be absent; medium-sized leaves badly discoloured with brown or black spots; and wilted basal fragments of older leaves sloughed off shortly after the disintegration of the bulk of their green tissues. The spotting is usually confined to the epidermis but may arise in any green tissue, developing into extensive plaques or mosaics of scattered, darkened cells. The streaking associated with the serial infection of the larger, longitudinally disposed mesophyll cells is generally sharply delimited and its margins spread rapidly, from 3 to 5 cm. a day, or more during the period of maximum activity in the summer. The cuticle and cortex of the stem are often, but not always, irregularly pigmented with dark brown or black. After the defoliation of the plant the stem may persist and produce several new shoots each season for a year or two, at the end of which time the reserve food supplies become exhausted and the weakened stems are invaded by bacteria, fungi, and attendant saprophytes, while the true roots soon decompose in the mud.

The fusiform cells and interconnecting system of pseudopodia peculiar to *Labyrinthula* were first observed in stained sections of diseased leaves from the Nantucket region of Massachusetts in the spring of 1934 [ibid., xiii, p. 793]. The belated detection of the parasite was probably due to its unusual distribution in the infected material, well ahead of the visible symptoms, its slight refractility, and its erratic reactions to staining. The spindle-shaped cells measure 10 to 20 by 5 to 8 μ and are motile, gliding along the interconnecting pseudopodial web at rates exceeding 50 μ per minute; they may collect into thick cords or strands (pseudoplasmodia) which also perform progressive movements, though less swiftly than the individual spindles, while a resting stage, in the form of light brown, cyst-like, spherical bodies, 6 to 10 μ in diameter, surrounded by less dense, thick cuticles, was also observed in the older infected tissues.

No changes attributable to the direct attack of the parasite on the stems and roots were discernible, the damage induced by its action being reflected only in the destruction of the food-synthesizing mechanism of the plant.

The parasitic character of the *Labyrinthula* in *Z. marina* was demonstrated by the following method. Thirty-six hanging drop preparations were made, each consisting of tangential sections of living, healthy leaf held against the under side of the cover-glass by a droplet of Seitz-filtered sea water in which, at a distance of 1 mm. from the test tissue, were placed fragments of diseased leaf containing viable cells of the pathogen. Within 8 to 48 hours the migration of motile spindles or the extension of pseudoplasmodia from the diseased to the healthy material was evident in 30 out of the 36 preparations, the progress of disintegration in the latter being identical with that previously observed in sections of living, diseased leaves. Ten uninoculated control mounts remained in a healthy state under the experimental conditions. These results were amply substantiated by those of the extensive inoculation experiments carried out in selected beds near Wood's Hole in 1934–5 by fastening fragments of diseased leaves on to healthy plants, in which over 50 per cent. infection developed after two days' contact.

So far the *Labyrinthula* from *Z. marina* has failed to develop on any of the artificial media tested, but large numbers of spindles and pseudoplasmodial masses are obtainable by culturing fragments of infected leaf in sealed hanging drop mounts.

LANCEFIELD (S.). **Moulds and food spoilage. A few practical notes.**—*Food*, liii, 5, pp. 196–198, 3 figs., 1936.

The available information on the etiology and control of food spoilage by moulds (principally *Penicillium glaucum*, *Mucor mucedo*, *Aspergillus glaucus*, and *Oidium* [*Oospora*] *lactis*) [cf. *R.A.M.*, xv, p. 241] in Great Britain is summarized in popular terms. The majority of moulds succumb to 30 minutes' exposure to a temperature of 60° C., while as a rule the spores are destroyed in 10 minutes at about 65°. It is therefore comparatively simple to kill any mould growths in food materials subjected to cooking in the factory, but extreme care is necessary to prevent subsequent contamination by spores in the atmosphere. As a case in point is cited the spoilage of many tons of butter and other

dairy products in a milk-powder factory with a wooden-lined ceiling. All food-manufacturing premises should be regularly disinfected with 0·25 to 0·5 per cent. sodium hypochlorite and the utensils thoroughly washed in boiling water. Air filtration is stated to have become a routine practice in many factories, where it effectively prevents damage by moulds.

Preston (N. C.). **A simple method of preserving and mounting specimens of fungal lesions, etc. for demonstration.**—*Trans. Brit. mycol. Soc.*, xx, 2, p. 190, 1936.

The author describes a simple, rapid method for preserving specimens of fungal lesions on plants in a fresh condition. A 2 per cent. agar solution containing about 0·1 per cent. mercuric chloride is poured into Petri dishes and when it has cooled to near solidifying point the leaves or other material are plunged directly into it and held in position until the agar solidifies. Specimens so prepared are stated to keep for many months.

Smith (K. M.). **Some aspects of the plant virus problem.**—*Sci. Progr. Twent. Cent., 1936*, 119, pp. 413–421, 2 pl., 1936.

This paper presents in a clear and readily intelligible form some of the more striking phenomena characteristic of virus diseases of economic and ornamental plants [see above, p. 444], and emphasizes both the scientific interest and the commercial importance of the problems arising out of these studies. Most of the work referred to has been noticed from time to time in this *Review*.

Smith (K. M.). **Recent work on the plant viruses.**—*Curr. Sci.*, iv, 8, pp. 565–569, 1936.

The author divides this concise summary of recent advances in the study of plant viruses [see preceding abstract] into three sections, the first dealing with some important features of the relationship between the viruses and their insect vectors, the second with the behaviour of the infective principle within its host, and the third with the investigation of the viruses outside the host. In conclusion, a brief note is given on the antigenicity of plant viruses.

Hatch (A. B.). **The role of mycorrhizae in afforestation.**—*J. For.*, xxxiv, 1, pp. 22–29, 3 figs., 1936.

After discussing 16 failures in afforestation projects in widely separated regions of the world where the cause in each case is traced to the lack of a biological factor in the soil, the author describes an experimental study of the mycorrhizal factor in afforestation [cf. *R.A.M.*, xv, p. 308] in relation to prairie soils.

Twenty germinated seeds of white pine (*Pinus strobus*) were planted in August, 1934, in each of six containers filled with freshly collected soil from a treeless area near Wyoming, mixed with two-thirds coarse silica sand. By early November the seedlings in all the containers were small, yellow, unthrifty, and had gone into premature winter dormancy associated with low nutrient conditions. The seedlings in three containers were then inoculated with pure cultures of *Boletus luteus* [ibid.,

xii, p. 778], *Boletinus pictis* [ibid., xiii, p. 458], *Lactarius deliciosus* [ibid., xii, p. 778], *L. indigo*, and *Mycelium radicis nigrostrigosum* [ibid., xv, p. 308].

Between 1st April and the end of May following the new needles in the inoculated pots became dark green and elongated rapidly, whereas in the uninoculated pots the new needles were yellow and short. The plants were harvested between 27th May and 5th June. In one inoculated pot some 30 per cent. of all the short roots showed mycorrhiza, produced by *B. luteus*, except for a few dozen formed by *L. deliciosus*. In the second inoculated pot, in which *B. pictis* had been introduced, the mycelium had spread slowly, but 13 out of the 20 seedlings had up to 90 per cent. of their short roots infected. Seedlings in the third pot showed the short roots to be all dead, though many had developed mycorrhiza. Analyses of the seedlings in the first two inoculated pots gave 1·241 per cent. nitrogen, 0·1957 per cent. phosphorus, and 0·744 per cent. potassium compared with 0·849, 0·0735, and 0·425 per cent. for the controls, representing increases of 86, 234, and 75 per cent., respectively, in favour of the mycorrhiza plants. The great increase in the absorption of these constituents demonstrated conclusively that the white pine seedlings grown in the prairie soil did not obtain sufficient nutrients to support normal growth when mycorrhiza were absent.

These results further indicate that mycorrhizal fungi are lacking in the soil of American prairies, that in their absence the absorption of nutrients by trees is liable to be inadequate, and that mycorrhizal fungi constitute the specific biological factor necessary for tree survival in prairie regions. In starting new nurseries and afforestation projects in the American prairies, seeds only should be used, to exclude pathogens, and mycorrhizal fungi must be introduced artificially.

Dillon Weston (W. A. R.). **The sporulation of Helminthosporium avenae and Alternaria solani in artificial culture.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 112–115, 1936.

In a further account of his studies on the sporulation of *Helminthosporium avenae* exposed to ultra-violet rays [*R.A.M.*, xii, p. 504] the author describes experiments showing that sporulation is induced by visible light of high intensity and not by ultra-violet light. A similar result was obtained in the case of *Alternaria solani*. In ordinary laboratory work it is thought that the light intensity is not sufficiently high to induce sporulation and the use of artificially illuminated incubators is suggested.

Fedotova (Mme T. I.). Биохимический метод определения степени паразитизма рода **Fusarium.** [A biochemical method for the determination of parasitism in the genus *Fusarium*.]—*Pl. Prot. Leningrad, 1935*, 1, pp. 115–118, 1935. [Received May, 1936.]

After a brief reference to the difficulties inherent in the determination of the pathogenicity of species of *Fusarium* found in association with plant diseases, as well as to the length of time required by the usual pathogenicity tests, the author gives a very concise outline of experiments designed to find a short laboratory method of establishing pathogenicity by correlating differences in biochemical properties with the

pathogenicity or non-pathogenicity of the species, a detailed report of which is left for the future. She found that in pure culture on glass wool in a standard solution (1 per cent. peptone, 2 per cent. glucose, 0·1 per cent. potassium dihydrogen phosphate, and 0·1 per cent. magnesium sulphate) the sharply parasitic species (*F. buharicum* [*R.A.M.*, xiii, p. 93], *F. lini*, and *F. graminearum*) accumulated from 3 to 5 mgm. amine nitrogen and 6 to 8 mgm. ammonia nitrogen [cf. ibid., xv, p. 388], while the purely saprophytic species (*F. falcatum* [*F. equiseti*] and *F. ossicolum* [*F. equiseti*]) accumulated 19 to 27 mgm. of the former and 35 to 52 mgm. of the latter, the difference being sufficiently significant to be of practical usefulness. Species intermediate in their pathogenicity (including *F. culmorum*, *F. vasinfectum*, *F. moniliforme* [*Gibberella moniliformis*] and *F. herbarum* [*F. avenaceum*]) accumulated intermediate amounts (11 to 19 and 9 to 28 mgm., respectively) of the two kinds of nitrogen. These results are admittedly preliminary, and subject to confirmation with other species of fungi, but a test carried out with the intermediately pathogenic *Verticillium dahliae* [ibid., xiii, p. 369] partially confirmed the validity of the method, since it was found that this fungus also accumulated only 8 mgm. of amine nitrogen and 18 mgm. of ammonia nitrogen per unit of weight.

Berkner (F.) & Hecker (G.). **Die Nachwirkung von verschiedenen Kalidüngern und Pflanzzeiten des Vorjahres auf den Pflanzgutwert von Kartoffeln.** [The after-effect of various potash manures and planting times in the previous year on the value of Potatoes for seed.]—*Landw. Jb.*, lxxxii, 1, pp. 125–139, 1935.

A tabulated account is given of the writers' observations at Breslau on the influence of various potash compounds and of the planting dates in 1933 on the health and yield of the 1934 potato crop. As in the previous series of observations [*R.A.M.*, xv, p. 111], the progeny of the late (July) plantings was in all respects the most satisfactory, while the deleterious effects of potassium chloride on the constitution of the plants were again apparent. The soundest stands in respect of degeneration were those receiving no potash in 1933.

O'Brien (D. G.). **Potato growing and research in Scotland.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iv, pp. 30–37, 1936.

In this paper it is stated that under the potato certification scheme of the Scottish Department of Agriculture the first official inspection of the growing crops [*R.A.M.*, x, p. 542] is generally made towards the end of June or early in July, the second in August, and the third in September. Varieties must be over 99·5 per cent. pure to obtain a TS certificate for an immune variety or an NI certificate for a non-immune variety. At the same time they must be comparatively free from virus diseases, and if in addition to being pure they are also up to the required standard in health a further certificate TS(H) or NI(H) is granted. A special stock seed certificate SS is given to especially pure and healthy varieties. In building up stocks for seed the usual practice is to select one or two very healthy plants having the varietal characteristics well developed. The progeny of such plants is grown apart, and any plant

suspected of virus infection is uprooted before it has time to infect others. During an official inspection a stock seed certificate is not granted if it is evident that over 10 per cent. of the plants have been removed by the farmer before the inspection.

Potato blight (*Phytophthora infestans*) in Scotland [ibid., iv, p. 437; vi, p. 747] is less important than it is in England, since as a rule it does not appear until August, and in many years until September. Very little spraying against blight is carried out, as in most years it would not pay. When spraying is effected, it is mainly done by those growing varieties for seed, and where the stocks are of exceptional value. The practice of burning down the haulms with 3 or 4 per cent. copper sulphate solution is becoming common [ibid., xiv, p. 527; cf. also xv, p. 45].

GIGANTE (R.). **Secondo contributo alla conoscenza della necrosi del cuore dei tuberi di Patata.** [A second contribution to the knowledge of heart necrosis of Potato tubers.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 4, pp. 555–560, 1 fig., 1935. [Received April, 1936.]

When potatoes of the Böhms Allerfrüheste Gelbe variety (*a*) healthy, (*b*) affected with heart necrosis [*R.A.M.*, xiii, p. 722], and (*c*) apparently healthy progeny of plants affected with this disease were planted in three plots in Italy the plants in plots (*b*) and (*c*) grew as well as the healthy controls, but the tubers showed 30 and 29 per cent. heart necrosis, respectively, while the yields from all three plots were approximately equal both in the number and size of the tubers produced. The disease was not transmitted, however, by grafting affected tubers on healthy tubers of the Noordeling variety and further experiments are required to determine whether the condition is attributable to a virus or not.

GIGANTE (R.). **Prime ricerche sul comportamento di alcune varietà di Patata italiane di fronte di virus.** [Preliminary researches on the behaviour of certain Italian Potato varieties towards viruses.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 4, pp. 533–547, 8 figs., 1935. [Received April, 1936.]

To ascertain whether the Italian potato varieties Basilicata bianca, Bianca di Como, Gialla del Fucino, and Riccia di Napoli are carriers of virus diseases the author made inoculations with their sap and by means of stem and tuber grafts as well as by *Myzus persicae* into Noordeling potato plants, White Burley and Samsun tobacco, tomatoes, *Nicotiana glutinosa*, and *Datura stramonium*, but no signs of disease appeared in any of the plants used as indicators.

When the same four potato varieties were inoculated by tuber grafting with the potato virus X from Magdeburger Blaue and the Y virus [*R.A.M.*, xv, p. 391] from Zeeuwsche Blaue potatoes the X virus affected only the Basilicata bianca and Riccia di Napoli varieties, producing 25 and 80 per cent. dwarfing, respectively, with complete loss of yield, while the Y virus affected only the Bianca di Como and Gialla del Fucino varieties, producing 33 and 60 per cent. dwarfing, respectively, with complete loss of yield. Neither virus produced any symptoms other than the dwarfing on any of the varieties.

Bates (G. H.) & Dillon Weston (W. A. R.). **The dying of the tips of Potato sprouts during 'chitting'.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iv, pp. 141–142, 1936.

A widely prevalent trouble with sprouted potato 'seed' when the tubers are set up in trays is the blackening and death of the tip of the sprouts. No pathogenic fungus was found in affected material, but it was noted that the trouble never occurred on sprouts 'chitted' in a good light, though seed chitted in darkness or semi-light was thin, etiolated, sappy, and easily damaged. When the shoots of potatoes chitted in darkness or poor light were slightly bruised experimentally darkening and browning of the tips generally ensued within twelve hours. If, however, the bruised shoots were kept in a bright light the discoloration gradually disappeared. When shoots grown in high light intensities were bruised accidentally or deliberately no marked blackening of the tips resulted.

Eddins (A. H.). **Bacterial wilt of Potatoes, Tomatoes, and Eggplant controlled with sulphur and limestone.**—Abs. in *Phytopathology*, xxvi, 2, p. 91, 1936.

Bacterial wilt of potatoes, tomatoes, and eggplants (*Bacterium solanacearum*) was successfully combated in Florida in 1934–5 by the application to the soil of (*a*) 800 lb. per acre of freshly inoculated sulphur and (*b*) 3,000 lb. of dolomitic limestone, the former treatment (given in June) reducing the reaction from P_H 5 to just below 4 and the latter (in November) restoring it to its original degree of alkalinity and inducing normal growth. The percentages of infection on Spaulding Rose potato tubers, tomatoes, and eggplants on the treated plots were 0·8, 17·9, and 5·9 per cent., respectively, the corresponding figures for the controls being 70·4, 98·8, and 70·6 per cent., respectively. The treatment resulted in an increased yield of potatoes of 23·1 bush. per acre.

Folsom (D.) & Bonde (R.). **List of distinct Potato viruses.**—*Amer. Potato J.*, xiii, 1, pp. 14–16, 1936.

The following 26 potato viruses are differentiated mainly on the basis of the symptoms induced in the Green Mountain variety: (1) tobacco mottle and (or) ring spot of J. Johnson, synonyms of which are potato mottle and potato ring spot of Koch and Johnson [*R.A.M.*, xiv, p. 523], seedling streak, latent virus, healthy potato virus, X virus [ibid., xv, p. 172], Fernow's B virus [ibid., v, p. 314], simple mosaic, and acro- or top necrosis [ibid., xv, p. 310]; (2) tobacco ring spot of Virginia [ibid., xi, p. 132 *et passim*]; (3) tobacco mosaic; (4) cucumber mosaic; (5) Green Mountain rugose mosaic caused by pure rugose mosaic and latent (synonyms, veinbanding and mottle or ring spot in combination); (6) Green Mountain mild mosaic (pure mild mosaic and latent); (7) Green Mountain crinkle mosaic (probably pure crinkle mosaic and latent); (8) Green Mountain leaf-rolling mosaic (probably pure leaf-rolling mosaic and latent) [ibid., xv, p. 246]; (9) Green Mountain interveinal mosaic (probably pure interveinal mosaic and latent); (10) aucuba mosaic [ibid., xiv, p. 385]; (11) Porter's calico [ibid., i, p. 448 *et passim*]; (12) Green Mountain streak (possibly Smith's Y [ibid., xiv, p. 327] and

latent); (13) streak of Koch and Johnson [ibid., xiv, p. 524]; (14) tomato spotted wilt; (15) Verplancke's 'bigarrure' [ibid., xiv, p. 251]; (16) leaf roll; (17) apical leaf roll of Schultz and Bonde [ibid., viii, p. 395] (Folsom's yellow top probably synonymous); (18) witches' broom (wilding) [ibid., xiv, p. 784]; (19) yellow dwarf [ibid., xv, p. 249]; (20) aster yellows [ibid., xiv, p. 312]; (21) beet curly top; (22) spindle tuber; (23) unmottled curly dwarf [ibid., xiv, p. 784]; (24) transmissible low-growing habit of M'Intosh; (25) pseudo-net necrosis; and (26) internal spotting in tubers.

Green Mountain mottled curly dwarf is stated to be a mixture of leaf-rolling mosaic and spindle tuber. It is thought that tobacco spot necrosis, crinkle, paracrinkle, Up-to-Date streak, acropetal necrosis, virus A of Ireland, and B, C, D, and Z of England may be identical with, or mixtures of, some of the foregoing, while marginal leaf roll and giant hill [ibid., xv, p. 247] may not be due to viruses at all.

Schultz (E. S.) & Raleigh (W. P.). **Acquired resistance of Potato to latent mosaic.**—Abs. in *Phytopathology*, xxvi, 2, p. 107, 1936.

Healthy Katahdin potato tubers and shoots, grafted on latent mosaic [see preceding abstract] Green Mountain, develop foliar and tuber necrosis. Tuber progeny of the necrotic shoots give rise to plants manifesting more or less acute necrosis, while mottled Katahdin shoots grafted on latent mosaic Green Mountain and healthy Katahdin on mottled Katahdin show mottling and mild necrosis. From these observations it would appear that mottled Katahdin has acquired resistance to latent mosaic, the virus of which harboured by this variety may further be an attenuated or weak member of the group [see next abstract].

Schultz (E. S.) & Raleigh (W. P.). **Reaction of a Green Mountain Potato seedling to composite infections of mild and crinkle mosaic and different types of latent mosaic virus.**—*Phytopathology*, xxvi, 2, p. 107, 1936.

The latent mosaic potato virus has been shown by means of inoculations on *Datura stramonium* to fall into four types, viz., faint [see preceding abstract], medium, severe, and virulent [*R.A.M.*, xiv, p. 261]. On Green Mountain inoculation with a complex of mild mosaic and severe latent causes distinct mottling and ruffling, while mild mosaic and faint latent induces the former symptom only, and mild mosaic alone results in slightly paler green and rugose foliage. These data indicate that different groups of viruses are responsible for mild and latent mosaic and that distinct pathological manifestations arise from inoculation with virus complexes of various types.

Lawrence (W. J. C.) & Newell (J.). **Seedling growth in partially sterilised soil.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iv, pp. 165–77, 7 figs., 1936.

As a result mainly of what appeared to be a severe fungal or bacterial infestation of the soil in which *Primula sinensis* was being grown, a system of soil sterilization (used in the usual sense of partial sterilization) and also sterilization of all vessels and appliances used in the rais-

ing and growing of pot plants under glass was introduced at the John Innes Horticultural Institution, Merton, London, where it has been in operation for over a year. The results have shown the practice of soil sterilization to be highly economical [*R.A.M.*, xi, p. 471], quite apart from the better growth obtained.

The soil is sterilized by steam at 212° F. for 30 minutes. In experiments with different composts, the addition of mortar rubble, slaked lime, or pure chalk exerted a deleterious effect on the heated compost resulting in a check to seedling growth. The results of experiments in which the compost ingredients, loam, moss-peat, and sand, were sterilized separately and in all possible combinations, showed that an interaction occurred between all three constituents, the best plants being obtained when the ingredients were sterilized separately. While some plants were very sensitive to the reaction of the ingredients, others hardly responded to it.

To ascertain whether the addition of fertilizers to the sterilized soil would rectify the poor growth still observed in some cases a number of tests were carried out which showed that the addition of nitrogen slightly improved growth, while potash made no difference or had a retarding effect; the addition of phosphate, however, was immensely beneficial. The effect of chalk (1 oz. per bush.) was variable, but growth was particularly good with chalk and superphosphate added. All seven loams used were found to be deficient in available phosphate, the addition of which is necessary to rectify this deficiency and to balance the changed soil conditions brought about by sterilizing.

Clarté (R.). **Trois maladies particulières du sol et leurs répercussions sur certaines plantes aux Pays-Bas.** [Three soil diseases and their repercussions on certain plants in the Netherlands.]—*J. Agric. prat., Paris*, N.S., c, 9, pp. 178–180, 4 figs., 1936.

This is a summary in popular terms of three soil diseases affecting oats and other crops in Holland, viz., 'Veenkolonial' [grey speck: *R.A.M.*, xv, p. 356], Hooghalen [soil acidity: ibid., xi, p. 471], and reclamation [ibid., xv, p. 355], the last-named having also been observed in Périgord (France), but not recognized as such at the time.

Linnemann (Germaine). **Beitrag zu einer Flora der Mucorineae Marburgs.** [Contribution to a flora of the Mucorineae of Marburg.]—*Flora, Jena*, N.F., xxx, 2, pp. 176–217, 25 figs., 1936.

The writer isolated from some 85 samples of soil from the Marburg district of Germany, as well as from miscellaneous organic substrata, some 60 species of Mucorineae [*R.A.M.*, xiv, p. 655] divided into 14 genera, *Mucor* being represented by 26 species, *Absidia* by 6, *Mortierella* by 12 (including *M. isabellina*) [ibid., xii, p. 242], and *Rhizopus* by 4 species, respectively; 12 species [German diagnoses of which are given] are believed to be new to science. Keys are furnished for the determination of species of the three last-named genera.

Salmon (E. S.). **Diseases of Hops.**—*J. Inst. Brew.*, N.S., xxxii, 6, pp. 235–237, 1935.

Notes are given on the mode of infection of hops by downy mildew

(*Pseudoperonospora humuli*) [*R.A.M.*, xiv, p. 792] and on the measures devised at the South-Eastern Agricultural College, Wye, Kent, for the control of the disease. Other fungal diseases of the crop enumerated are mould (*Sphaerotheca humuli*), canker (*Fusarium* sp.), wilt (*Verticillium albo-atrum*) [ibid., xiii, p. 354], leaf spot (*Cercospora cantuariensis*) [ibid., vii, p. 599], die-back (*Phoma* sp.), grey and black moulds (*Botrytis cinerea* and *Cladosporium* sp., respectively), and hop drop (*Macrosporium* sp.). Observations are further made on three virus diseases, viz., nettlehead [ibid., xi, pp. 539, 744], mosaic [ibid., xiv, p. 423], and chlorotic disease [ibid., xv, p. 257], and on four of obscure origin, namely, split leaf [ibid., xiv, p. 423], split leaf mottle, small hop [ibid., xii, p. 122], and crown gall (in the swellings associated with which there is stated to be no evidence of infection by *Bacterium tumefaciens*).

PARHAM (B. E. V.). **Wilt disease of 'Yangona'.**—*Agric. J. Fiji*, viii, 1, pp. 2–8, 1935. [Received May, 1936.]

The wilt of yangona (*Macropiper* [*Piper*] *methysticum*), previously reported from Fiji [*R.A.M.*, xv, p. 137] as probably caused by a bacterium in association with *Fusarium* and a *Neocosmospora*, is stated to progress frequently from higher to lower ground; one side of a gully may be completely devastated, while the other remains unaffected, the line of demarcation being the watercourse at the bottom. In young plantations incidence is frequently dispersed and sporadic, suggesting that infection is carried in the planting setts. The areas first and most severely affected in Suva-Rewa were those planted with setts from Lami, where the disease was first observed. So far it does not appear to have spread beyond the Suva-Rewa and Lami areas. The disease may still be controlled by destroying affected plants before abandoning infected areas, by roguing diseased plants from all plantations, and by selecting planting material from healthy stands. For some time at least the planting of large areas should be discouraged or prohibited except under supervision.

ROSENFELD (A. H.). **Sugar Cane breeding in Egypt. A progress report.** —*Bull. Minist. Agric. Egypt* 161, 20 pp., 3 pl. (1 col.), 1935.

After a brief botanical account of the genus *Saccharum*, the author summarizes the progress attained in the breeding in Egypt of new varieties of sugar-cane, in the attempt to obtain types superior to P.O.J. 105 which still remains by far the best general-purpose variety in the country, especially owing to its remarkable resistance to streak [*R.A.M.*, xiv, p. 56] (which is stated to be very prevalent on P.O.J. 2878 in Egypt), mosaic, and leaf spot [*Helminthosporium sacchari*]. Most of the work is still in the preliminary stage, but a few of the descendants of the crosses tested (all of which were made in other countries, because no fertile sugar-cane seed can be produced in Egypt owing to its sub-tropical climate) appear to be promising. Special mention is made in this respect of the progeny of the United States self-pollinated 666 designated Egypt 8, which, while readily taking streak, is apparently quite tolerant of this disease, as well as of the progeny of a cross between P.O.J. 2878 and Uba Marot, eight lines of which (E–9 to E–16, inclusive)

combine high commercial and technical qualities with high disease resistance.

DEY (P. K.). **Diseases of Sugar-Cane.**—*J. Sci. Tech., India*, i, 2, pp. 23–30, 1935.

Some interesting facts are mentioned in connexion with this semi-popular account of sugar-cane diseases occurring in the United Provinces, India (where 16 of the 39 recorded on the crop up to 1932 are stated to be found). The most important is mosaic [*R.A.M.*, xv, p. 398], followed by red rot (*Colletotrichum falcatum*) [ibid., xiii, p. 803; xv, p. 116] and stinking rot [*Bacillus pyocyaneus saccharum*: ibid., xiv, p. 395; xv, p. 316]. Researches at Pusa, Patna, and Cawnpore during the last three years have shown that in severe cases of mosaic the total loss in Co. 213 may amount to 12 per cent. of the crop, while in Pounda canes the yield is reduced by two-thirds. The predicted failure of the otherwise valuable Co. 213 through mosaic is rapidly being fulfilled, and every effort must be made to secure an equally desirable substitute free from the disease. The problem of control by selection and roguing is briefly discussed.

The conversion of cane sugar into glucose and alcohol by *C. falcatum* (giving rise to the sour smell characteristic of red rot) entails the failure of the juice to crystallize on boiling and leads to considerable losses on the part of the manufacturers. Some years ago this disease was observed in an epidemic form in Pilibhit, Gorakhpur, Shahjahanpur, Bareilly, and Cawnpore, where the fields presented an extraordinary appearance. A few of the older leaves in nearly every plant would break in the middle, where a bright red patch developed; above this point desiccation set in while the lower half remained green except for the discoloured margin at the broken end. An important measure for the control of the disease is the discontinuance of ratooning, which provides a ready means of perpetuation for the fungus in the shape of old stumps.

B. pyocyaneus saccharum is stated to be largely amenable to control by selection and timely roguing, but the borer insects [*Scirpophaga*] implicated in its transmission cannot be effectively combated.

MCKAIG (N.) & FORT (C. A.). **Chemical composition of juice of Louisiana Sugarcane injured by the Sugarcane borer and the red rot disease.**—*J. agric. Res.*, lii, 1, pp. 17–25, 1936.

The results of tests in 1931 and 1932 in Louisiana showed that both the quantity and quality of the juice extracted from the commercial sugar-cane varieties P.O.J. 36–M, P.O.J. 213, P.O.J. 234, and Co. 281 are materially reduced by attacks by the sugar-cane borer (*Diatraea saccharalis*), the reduction being still greater in canes exhibiting a combination of injuries from the borer and the red rot disease (*Colletotrichum falcatum*) [see preceding abstract]. The reduction in quality involved an increase in the colour and turbidity of the clarified juices and syrups, in the mineral constituents of the juice, and in protein and non-protein nitrogen compounds, especially of the latter. The changes in the chemical composition of the juice were generally greater in the

case of the susceptible variety P.O.J. 213 than in the other varieties tested.

Destructive Insect and Pest Acts, England. The Sale of Diseased Plants (Amendment) Order of 1936. Dated February 27, 1936.—2 pp., 1936.

An Amendment (effective as from 1st May, 1936) to the Sale of Diseased Plants Order of 1927 [*R.A.M.*, vi, p. 447] extends the provisions of that Order in such a way that it will be an offence to sell, offer, or expose for sale, or, after sale, to deliver for planting in England, any plant substantially affected by the diseases specified in the original order [i.e., fruit tree cankers [including *Nectria galligena*], American gooseberry mildew (*Sphaerotheca mors-uvae*), silver leaf (*Stereum purpureum*), and powdery scab (*Spongospora subterranea*) of potatoes]. Similar regulations, to take effect from 15th May, 1936, have been issued (14th April) by the Department of Agriculture for Scotland (4 pp.), with the substitution for *S. subterranea* on potatoes of *Urocystis cepulae* on onions [cf. *R.A.M.*, xiv, p. 544].

British Guiana. Ordinance No. 37 of 1935.—8 pp., 1935.

The Plant Diseases and Pests (Prevention) Ordinance, 1935 (published 28th December) of British Guiana defines the regulations governing the importation and exportation of plants and the precautions to be taken against the introduction, transmission, and spread of diseases and pests within the Colony.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, viii, 1, pp. 20–23, 25–26, 28–29, 1936.

Germany. Regulations similar to those enforcing the destruction (where treatment is no longer indicated as profitable) of fruit trees attacked by canker [*Nectria galligena*] and other diseases and pests in Saxony [*R.A.M.*, xiv, p. 736] have been issued in respect of Saarland (7th January, 1936) and Thuringia (21st December, 1935).

Finland. An Order of 27th September, 1935, prescribes that all potatoes entering Finland must be accompanied by official certificates vouching for the freedom of the consignments from wart disease (*Synchytrium endobioticum*), which must further be declared to be absent from a radius of at least 50 km. from the place of cultivation. A maximum of 5 per cent. of frozen, mouldy, or otherwise decayed tubers will be admitted. These regulations supersede those of 12th November, 1925, concerning the conditions for the importation of potatoes into Finland and their transit through the country [cf. ibid., v, p. 190]. A list is given of the ports through which entry may be effected.

Austria. As from 1st January, 1936, special permits from the Federal Ministry of Agriculture are required in respect of all potato consignments from countries deemed to be infested by wart disease [*Synchytrium endobioticum*: ibid., xiv, p. 64], supplies from which should in general be limited to the immediate needs of the population.